BULLETIN OF MISCELLANEOUS INFORMATION No. 2 1939
ROYAL BOTANIC GARDENS, KEW

VII—AMARYLLIS AND HIPPEASTRUM. J. R. Sealy.

I. Introduction.

In the first edition of his "Species Plantarum" (**1**, 292–293: 1753) Linnaeus placed nine species in the genus *Amaryllis* L., and these nine species belong to as many different genera according to our modern concepts of the genera of *Amaryllidaceae*. As a result of this original wide concept of the limits of *Amaryllis*, still further diverse elements were included within it during the years that followed the publication of Linnaeus's work, and by the beginning of the nineteenth century it had come to include about fifty species representing at least a dozen different genera. Some of the original nine species of *Amaryllis* were referable to certain genera (*Brunsvigia* Heister, *Sprekelia* Heister, *Imhofia* Heister, *Atamasco* Adanson, and *Sternbergia* Waldst. & Kit.) that had been proposed during the period between 1753 and 1805, but these genera either remained unknown to students of the family or were not recognized by them, and the genus *Amaryllis* was generally accepted as being very polymorphic.

The task of sorting the diverse elements that constituted this *Amaryllis*, *sensu latiore*, into homogeneous groups and defining them as distinct genera was first attempted in 1819 by Herbert (Bot. Mag. sub t. 2113). Two years later he dealt with the problem in more detail, correcting his previous work in certain respects, and extending it to include all the genera of *Amaryllidaceae*, and this work, published under the title "An Appendix" (actually to vol. 6 of the Botanical Register), forms the basis of all the succeeding taxonomy of the family. In the "Appendix" Herbert restricted the name *Amaryllis* to the Cape plant now so well-known to botanists and gardeners alike as *Amaryllis Belladonna*, and distributed the other diverse elements of *Amaryllis* among other genera, some of which he established for their reception.

For some years students of the *Amaryllidaceae* have known that the Cape plant to which Herbert applied the name *Amaryllis Belladonna* was not, apparently, the plant that Linnaeus meant when he first gave that name to one of the species of *Amaryllis* in the first edition of his Species Plantarum (1753). Under the name *Amaryllis Belladonna* Linnaeus cited certain synonyms, which evidently all refer to the American plant now known as

Hippeastrum equestre (Linn. fil.) Herb.,* and not to the Cape Belladonna at all; in fact Linnaeus gave the habitat of his species as "*in* Caribaeis, Barbados, Surinama." The matter was mentioned by the late Dr. Stapf in a footnote on page 3 of his article on ×*Crinodonna Corsii* in the Botanical Magazine, t. 9162 (1929), but nothing was published about the problem until last year, when an article by Dr. Uphof appeared in "Herbertia" (1938, pp. 100–109, tt. 107–109). Uphof comes to the conclusion that *Amaryllis Belladonna* L. is the correct name for *Hippeastrum equestre* (Linn. fil.) Herbert, that the genus *Hippeastrum* Herbert must be renamed *Amaryllis* L., and that the Cape Belladonna must receive the name *Callicore rosea* Link. These conclusions seemed reasonable at first sight, but on closer examination it appeared that the complexities of the case had not been fully appreciated by Uphof, and that it would be necessary to reconsider it in more detail and from a different angle before one could judge whether or not his conclusions were correct.

The case was accordingly fully re-investigated and the results are given below. The problems concerned are much more involved than would appear from Uphof's account, and form another example of the difficulties so often experienced when attempts are made to identify and typify Linnaean genera and species, and illustrate the necessity for caution in dealing with such problems.

Whilst taking entire responsibility for the views expressed in this paper, I gratefully acknowledge the help given to me, by way of advice and discussion, by Messrs. J. Ardagh and J. E. Dandy of the British Museum (Natural History) and by Mr. Spencer Savage of the Linnean Society. Dr. T. A. Sprague has been kind enough to go over the MS. in detail with me, and I am greatly indebted to him for the many suggestions he has made and the advice he has given.

II. The Identity and Typification of Amaryllis Belladonna L.

The name dates from Linnaeus, Species Plantarum, **1,** 292 (1753), where the species is defined as "*Amaryllis spatha multiflora, corollis campanulatis aequalibus, genitalibus declinatis*" and a reference is given to Linnaeus, Hortus Cliffortianus, 135 (1737) where that phrase is used for the first time. In addition Linnaeus cites certain synonyms, with references to earlier authors, and gives the habitat of the species as "*in* Caribaeis, Barbados, Surinama." The references, synonyms, and habitat apply, as stated above, to the American plant we know as *Hippeastrum equestre*, and therefore at first sight it seems clear that *Amaryllis Belladonna* L. was actually

* This name was based on *Amaryllis equestris* Linn. fil. ex Aiton, Hort. Kew. **1,** 417 (1789), which, however, is antedated by *Amaryllis puniceus* Lamarck, Encycl. Méthod, **1,** 122 (1783). The correct name for the species under *Hippeastrum* is accordingly *H. puniceum* (Lam.) Urban, Symb. Antill. **4,** 151 (1903), but for the purposes of this paper the better-known name *H. equestre* is retained.

Hippeastrum equestre (Linn. f.) Herb. Three points, however, suggest caution in accepting this conclusion: (1) three authors of Linnaeus's own time, Philip Miller, John Miller, and the younger Linnaeus, actually applied the name *Amaryllis Belladonna* to the Cape plant known under that name to-day; (2) we know from contemporary literature* that the Cape Belladonna was a well-known garden-plant in Linnaeus's day, and it seems incredible that Linnaeus would not have known of it, and if he knew the plant, it is only reasonable to suppose that he would have included it in his "Species Plantarum"; (3) as already mentioned, Linnaeus diagnosed his *A. Belladonna* with a phrase taken from his "Hortus Cliffortianus," a work which deals with the identification and classification of plants grown in the garden of Georg Clifford at Hartecamp, Holland, and of specimens in Clifford's herbarium, so that we can say that Linnaeus must have seen either a dried specimen or living plants (or both) of his *Amaryllis Belladonna*, and that *this species was not based merely on the synonyms he quotes*. This fact was apparently unnoticed by Uphof, but it at once raises the question, was that specimen or plant really the American *Hippeastrum equestre*, or could it have been the Cape Belladonna?

Further investigation has brought to light the evidence detailed below:—

(1) In the "Viridarium Cliffortianum," Linnaeus gave a list of all the living plants in the Clifford garden during the years 1735, 1736 and 1737, and among them is the "Amaryllis spatha multiflora, corollis campanulatis aequalibus, genitalibus declinatis," the plant which he subsequently named *Amaryllis Belladonna*. Linnaeus therefore certainly knew a living plant of this species.

(2) In the Clifford herbarium,† now at the British Museum (Natural History), London, there is a specimen immediately recognizable as the *Cape Belladonna*. The specimen bears no name or identification, and therefore there is no ground for stating either that it is the basis of *Amaryllis Belladonna*, or that it is the plant which Linnaeus knew in the Clifford garden, for the specimen may have been added to the herbarium after Linnaeus had left Holland. On the other hand, the absence of data on the sheet suggests that this specimen was grown in Clifford's garden, and there is a possibility that the species was growing there, or that the specimen was in Clifford's herbarium, when Linnaeus was writing the "Hortus Cliffortianus," and it is therefore possible that the specimen represents one of the species described in that work. It is obviously referable to the genus *Amaryllis* and can be referred

* For example, Miller, Gard. Dict. ed. 1 (1731). Actually the Cape Belladonna was in cultivation in Italy as early as 1633, *fide* Ferrari, De Florum Cultura, 116–118, c.c. (1633). In the Italian version of that work (Flora overo Cultura di Fiori, 118: 1638) the common name is given as "Donna bella."

† An excellent account of it was given by the late Dr. A. B. Rendle in his Presidential Address to the Linnean Society in 1924, see Proc. Linn. Soc. 1923–24, 38–42 (1924).

only to the second species, the one which in 1753 Linnaeus named *Amaryllis Belladonna.*

(3) The Cape Belladonna and the American *Hippeastrum equestre* are markedly dissimilar plants, and if Linnaeus had known the latter in cultivation and had based his diagnosis of *Amaryllis Belladonna* upon it, one would expect the fact to be evident from his diagnosis. The latter reads: "*Amaryllis spatha multiflora, corollis campanulatis aequalibus, genitalibus declinatis*" and there are two points in it which are not in keeping with *Hippeastrum equestre.* The first is "*spatha multiflora,*" which is scarcely descriptive of a plant 2–4 flowers, even if used as a contrast to species "*spatha uniflora.*" Had Linnaeus been describing *Hippeastrum equestre,* it is surely more likely that he would have written "*spatha pauciflora,*" and it should be noticed that all the other species of *Amaryllis** described as "*multiflora*" in the "Species Plantarum," ed. 1, really are many-flowered. On the other hand, in the second edition of the "Species Plantarum," Linnaeus accepted Miller's description of *A. Reginae* as "*multiflora,*" though this species is generally 2–4-flowered. It might therefore be said that "*multiflora*" should be taken as meaning "more than one-flowered" in contrast to the "*uniflora*" of other species. It should be remembered, however, that in the case of *A. Reginae* Linnaeus was merely recording Miller's work, whereas for *A. Belladonna* the diagnosis was original and written by Linnaeus himself.

The second point concerns the "*corollis campanulatis.*" No one who knew living plants (and it must not be forgotten that Linnaeus knew his *Amaryllis spatha multiflora* . . . etc. in life) or even good figures of *Hippeastrum equestre,* could describe the flowers as campanulate. The flower has a most characteristic shape, as shown in figure 1 (actually taken from one of the works cited by Linnaeus), and I suggest that it is exceedingly unlikely that Linnaeus would have described it as "*corollis campanulatis.*" On the other hand, both the "*spatha multiflora*" and the "*corollis campanulatis*" are understandable if Linnaeus was dealing with the Cape Belladonna, for in that plant the stem bears 10 or 12 flowers, which, as shown in figure 2, would be accepted as campanulate as that term was used by Linnaeus.

(4) In the "Hortus Cliffortianus," under *Amaryllis,* Linnaeus wrote:—"Lilio narcissus vocabulum est consarcinatum, quod rejicio. Flores hujus generis eximii sunt, nescio num 2-da parem habeat, hinc Bellae donnae dictae plures; Bella donna virgilii, Amaryllis dicta, nomine transiit in proverbium de omni grato, et de secunda specie apud Hortulanos quosdam, quae cum et radice amara sit, pro Amarella Amaryllis dicatur."

This may be translated:—"Lilio-narcissus is a patched-together designation which I reject. The flowers of this genus are very

* *A. sarniensis* (*Nerine*), *A. zeylanica* (*Crinum*), *A. longifolia* (usually placed in *Ammocharis*), *A. orientalis* (*Brunsvigia*), and *A. guttata* (*Boophone*).

S.R-C.

1. *Hippeastrum equestre* Herbert (copied from Merian, Metamorph. Insect. Surinam, t. 22: 1705). 2. *Amaryllis Belladonna* L. emend, L'Hérit. (copied from John Miller, Illustr. Syst. Sex. Linn. t. 18: 1770 on plate, 1771 on title page); both figures two-thirds natural size.

beautiful—I do not know that the second species has an equal—hence many are called Belladonna. The Belladonna of Virgil was called Amaryllis and this name has passed into proverb for any beautiful thing, and has been used among certain gardeners for the second species, which although it has a bitter root, is called Amaryllis in place of Amarella."

The " second species " to which Linnaeus referred in this note is the one he named *A. Belladonna* in 1753, and two points stand out at once. First that the species had such beautiful flowers that Linnaeus doubted if it had an equal, and second that the species was at least fairly well-known in cultivation since it had already received the name *Amaryllis* in gardens. Both remarks apply to the Cape Belladonna—no one would dispute that its flowers are exceedingly beautiful, and it was certainly well-known in gardens in Linnaeus's time (see next paragraph)—but one could scarcely claim that *Hippeastrum equestre* had no equal in beauty of flowers, and it was certainly *not* well-known in cultivation in Linnaeus's day, in fact it was very rare.

(5) The Cape Belladonna was in cultivation in Italy in 1633. It was included by Morison in his " Plantarum Historiae " (1680), and by Miller in his " Gardeners' Dictionary " from the first edition (1731) onwards ; it was apparently introduced into this country at an early date and became well-known. *Hippeastrum equestre* may also have been in cultivation in England in Miller's time, for his *Lilio-Narcissus* no. 3, the West Indian Red Lily (Gard. Dict. Ed. 1–4 : 1731–43), stated to be very rare in England, may have been that species. It should be noted, however, that the West Indian Red Lily of Ed. 6 and Ed. 7 (1752–59) was another species, *H. Reginae* and that this had been introduced in 1728. The Cape Belladonna was growing at Leyden in 1681–1686 and is included in Hermann's " Catalogus " (1687), where, incidentally, it is called *Lilium africanum* . . . . etc. It was at Leyden when Boerhave prepared his " Index Alter " (1720), and in that work there is also a reference to the American *Hippeastrum equestre*. Only one species is mentioned, however, by Royen in his account of the Leyden garden (1740) and that species was recorded under the Linnaean phrase-name* for *Amaryllis Belladonna*, with synonyms belonging to the American plant. It is scarcely likely that two such different plants as the Cape Belladonna and the American *Hippeastrum* would be identified with one another in a garden, and hence it is most likely that one or the other had disappeared from the Leyden garden by 1740. Of the two, the American plant, which has to be grown under glass and requires careful treatment, is more likely to have disappeared than the hardy Cape plant. It is therefore much more likely that the plant recorded by Royen was the Cape Belladonna. All the

* Royen was assisted by Linnaeus in his re-arrangement of the Leyden garden—see Daydon Jackson, " Linnaeus," 163 (1923).

available evidence, in fact, points to the Cape Belladonna being well known in gardens in Linnaeus's day, whereas the American *Hippeastrum equestre* was rare.

(6) Philip Miller, in his " Figures of Plants " (1755) figured the Cape Belladonna under the name *Amaryllis spatha multiflora . . . etc.* of the " Hortus Cliffortianus," and in the second edition of the " Species Plantarum," Linnaeus cited Miller's figure as an illustration of his *Amaryllis Belladonna*. Miller stated that the plant was well known in gardens as the Belladonna lily, and that it had been identified by Sir Hans Sloane with a plant which he had obtained in Barbados and which he had called *Lilio-narcissus polyanthos, flore incarnato, fundo ex luteo albescente* (Sloane, Cat. 115, Hist. I. 244). Miller goes on to say, however, that from all he can learn there are two species of " lily " in the West Indies, one white-flowered and evidently a *Pancratium*, the other red-flowered and certainly *not* the Belladonna lily. In the next plate of his "Figures," Miller gives an illustration of the plant known in English gardens as the " Mexican Lily," which, he says, had been named *Lilium Reginae* by Dr. James Douglass, " because it was in full Beauty on the First of *March*, which was the late Queen's Birth-day." This plant is the one known to-day as *Hippeastrum Reginae*. With it Miller identified the *Lilium Americanum puniceo flore, Belladonna dictum* described and figured by Hermann in his " Paradisus Batavus " 194 (1698), but he adds " Doctor *Herman* says it came from the *Caribbee Islands* ; but all the Roots which I have received from those Islands, by the Title of *Red Lily*, are of a different sort from this." In this statement Miller was perfectly correct, for the Red Lily of the West Indies is *H. equestre*. The mistake that Miller made was in identifying Hermann's plant with *H. Reginae*, for Hermann's plant is unmistakably *H. equestre*. Now Linnaeus included Miller's " Mexican Lily " as a new species of *Amaryllis* in the second edition of his " Species Plantarum " and named it *A. Reginae*, quoting, as a synonym, the Hermann reference already mentioned. This means that under *A. Reginae* his synonym referred to another plant, *Hippeastrum equestre*, whilst the references in the same work under *A. Belladonna* likewise belonged to *H. equestre*. It may be noted that in one of the works in the synonymy of *A. Belladonna*, namely, Merian's " Metamorphosis," the plant described and figured is identified with the Hermann plant, and also that in the " Hortus Cliffortianus " Linnaeus had actually included the Hermann reference in the synonymy of the plant he afterwards named *A. Belladonna*. The conclusion seems to be that Linnaeus did not critically examine the literature, and that he had no clear idea of the identity of the plants described and figured in the works cited. In fact, it is most likely that the synonyms cited by Linnaeus in the " Hortus Cliffortianus " represent " book-work " hastily compiled owing to the great pressure under which that work was written.

In the second edition of the "Species Plantarum" Linnaeus emended his diagnosis of *Amaryllis Belladonna* by adding "*ungue reflexis*" to the original "*corollis campanulatis aequalibus.*" This was evidently put in the better to distinguish it from *A. Reginae*, for under the latter he says it differs from *A. Belladonna* by the petals being undulate at the margin and *not recurved into a claw* ("*nec ad ungues recurvatis*"). Now Linnaeus did not get this additional character from Miller, for the latter does not mention it, nor is it shown in his plate, and we must therefore conclude that Linnaeus derived it from a plant or specimen which he accepted as his own *Amaryllis Belladonna*. This recurving of the apex of the outer perianth-segments in the shape of a claw is characteristic of the Cape Belladonna, but does not occur, so far as I am aware, in *Hippeastrum equestre*. In the latter the apices may be shortly apiculate or minutely cucullate but can scarcely be described as "recurved in a claw." The claw-like apices are very clearly shown in John Miller's excellent figure of the Cape Belladonna in his "Illustration of the Sexual System of Linnaeus," t. 18, part of which is reproduced in figure 2. This work was known to Linnaeus, who formed a high opinion of it, but the plate of *Amaryllis Belladonna* did not appear until 1770 (date on plate), that is, long after the second edition of the "Species Plantarum." It would seem that some time between 1753 and 1762 Linnaeus became acquainted with Miller's "Figures of Plants," and that before accepting Miller's "Mexican Lily" as a new species of *Amaryllis*, he examined a plant or specimen of his own *A. Belladonna* to see how the new species differed from it, and that he noted the claw-like apex of the outer segments. This would mean that Linnaeus was perfectly aware of the identity of his *A. Belladonna*, and that that species was the Cape plant. It may be of interest to add that in his own copy of the "Species Plantarum," ed. 2, Linnaeus has written in a short description for *A. Belladonna*, which reads as follows: "Corolla regularis campanulata statura Hemerocallidis, incarnata, fundo viridi albicante. Petala 3 exteriora apice ungue intus retro spectante. Petala 3 superiora basi ciliata. Stamina declinata rubra. Antheris albidis. Pistillum rubrum apice albo. Caulis teres, parum compressus. Bulbis viridis." This evidently applies to the Cape Belladonna, and together with the work published in ed. 2 of the "Species Plantarum," shows conclusively that Linnaeus *did* accept the Cape plant as his *A. Belladonna* some time between 1753 and 1762; but it does not necessarily mean that he based the species on the Cape plant when he first described it in 1737. The fact that Linnaeus did accept the Cape plant as *A. Belladonna*, however, in conjunction with the fact that the 1737 description and reference to the outstanding beauty of the flowers both apply to the Cape plant, seems to justify the conclusion that the species was based on the Cape plant. It may be mentioned that Trew (Hort. Amoen. Fl. Imag. Ed. Seligmann, **1**, p. N2. verso, t. 12) also described the

Cape plant under the phrase that Linnaeus used in 1737, and figured it as "Belladonna." The title-page of volume I is dated 1750, and if the work had been written prior to that date, it would mean that even before 1753 the Cape plant had been recognized as the species described by Linnaeus in 1737. However, on the page of Trew cited is a reference to another work the date of which is given as 1766, so that Trew's work must have appeared during or after that year.

(7) In 1775 a thesis, prepared under Linnaeus's direction by one of his pupils, Jacobus Alm, was published under the title "Plantae Surinamenses."* This thesis deals with the identification of a collection of Surinam plants and among them is an *Amaryllis* which is dealt with thus:—"39. Amaryllis 98. dubia. *Mer. surin. t.* 22. Corolla basi laciniarum barbata." That is to say, that no. 98 was an *Amaryllis* whose specific identification was doubtful but which was the plant figured by Merian. The latter, of course, is the American *Hippeastrum equestre*, and, since Merian's work was actually cited by Linnaeus under *Amaryllis Belladonna* in the "Species Plantarum," one would normally have expected that Alm would have given this name for the *Amaryllis* no. 98 of the collection. That he did not do so seems to imply that either he or Linnaeus had become aware that the American plant was *not A. Belladonna*.

(8) The younger Linnaeus prepared a MS. on certain plants, including a number of *Amaryllidaceae*, which remained unpublished and is now in the possession of the Linnean Society of London. This MS. recently formed the subject of an article by Mr. Spencer Savage in Herbertia, 1937, 92–99, in which he showed that the MS. was written about 1781–83, and that it formed the source of the diagnoses of various plants which were published in Aiton's "Hortus Kewensis" (1789) and there attributed to "Linn. fil.," the diagnoses concerned having been sent to Aiton by Linnaeus fil. himself (see Aiton's Preface, p. vi). Among the plants dealt with are those with which we are concerned, and it is instructive to notice that the younger Linnaeus completely clears up the confusion which surrounds *Amaryllis Belladonna* and *A. Reginae*. He does this by restricting the name *A. Belladonna* to the Cape Belladonna (as may be easily demonstrated from the references he gives), by restricting the name *A. Reginae* to the plant figured by Miller, and by establishing a new species, *A. equestris*, to cover the American plant which Linnaeus had placed in the synonymy of *A. Belladonna* (by citing the works of Sloane, Seba and Merian under that species), and which Miller had misidentified with *A. Reginae* (when he cited Hermann, Par. Bot. 194 as a synonym of the latter). Incidentally, the habitat of *A. Belladonna* was not given in Aiton's "Hortus Kewensis," but it is evident from Savage's account (p. 99) that the younger

* Reprinted in Linné, Amoen. Acad. Ed. Schreberus, VIII. pp. 249–267 (1785).

Linnaeus knew that it came from the Cape, and wrote in the MS. " Habitat in Africa Australi : Cap : Bona Spei." The name *Amaryllis Belladonna* was also restricted to the Cape plant by L'Héritier in his Sertum Anglicum, 11–13 (1788). Moreover, L'Héritier quoted much of the earlier literature concerning the plant, and gave its home as the " Cape of Good Hope," a piece of information which may have been derived from one of the works he cited, namely, Petiver, Gazophylacii Nat. Art. 9, t. 85, fig. 5, et Cat. Class. Sec. Vol. p. 4, no. 497 (1764). The Sloane, Seba and Merian references, which Linnaeus senior had placed under *Amaryllis Belladonna*, were transferred by L'Héritier to *A. Reginae*. L'Héritier obviously recognized that these references were to the same plant as the one figured and described by Hermann, but he apparently did not realize that they all represented a species distinct from *A. Reginae*.

The evidence from the foregoing discussion may be conveniently summarized thus :—

(a) Linnaeus knew a living plant of his *Amaryllis Belladonna* in Clifford's garden ;

(b) The Cape Belladonna was a well-known garden plant in Linnaeus's day ; it is most unlikely that it was unknown to Linnaeus, and if he knew the plant he would certainly have accounted for it in his " Species Plantarum " ; *Hippeastrum equestre* was rare in cultivation ;

(c) There is a specimen of the Cape Belladonna in the Clifford Herbarium, but no specimen of *Hippeastrum equestre* ;

(d) Linnaeus especially mentions his *Amaryllis Belladonna* as an *outstandingly* beautiful species ; it was apparently reasonably well-known in cultivation, since Linnaeus mentions the name given to it in gardens : these remarks are applicable to the Cape plant, but scarcely to *Hippeastrum equestre*.

(e) Linnaeus's original diagnosis of his *Amaryllis Belladonna* fits the Cape plant better in two respects (" *spatha multiflora* " and " *corollis campanulatis* ") than it does *Hippeastrum equestre*.

(f) In the second edition of his " Species Plantarum," Linnaeus cited a figure of the Cape plant as an illustration of *Amaryllis Belladonna*, and added to the diagnosis a character (" *corollis . . . ungues recurvatis* ") present in the Cape Belladonna but not in *Hippeastrum equestre*. Moreover, Linnaeus must have seen this character in a specimen or living plant, for it is not mentioned in the literature, nor shown in any of the illustrations cited by him. Furthermore, Linnaeus wrote a description of his *Amaryllis Belladonna* in his own copy of " Species Plantarum " ed. 2, and that description is of the Cape Belladonna. This all shows that Linnaeus himself accepted the Cape plant as his *A. Belladonna*.

(g) Under *A. Reginae* Linnaeus, following Miller, erroneously cited as a synonym the *Lilium Americanum* . . . . etc. of Hermann,

which he himself had cited under *A. Belladonna* in 1737, and which is the same plant (*Hippeastrum equestre*) to which his synonyms under *A. Belladonna* belong. This indicates that Linnaeus had not examined the literature carefully.

(h) In 1775 the Merian reference, given in the synonymy of *A. Belladonna* by Linnaeus in 1737 and 1753, was cited in a thesis prepared under Linnaeus's direction, as an *Amaryllis* whose identity was doubtful.

(i) Three botanists of Linnaeus's own times, Philip Miller, L'Héritier, and the younger Linnaeus, all agree in identifying *Amaryllis Belladonna* L. as the Cape plant, and excluding from it the American *Hippeastrum equestre*.

Taken as a whole, this evidence indicates that Linnaeus knew the Cape Belladonna, that he almost certainly based his *Amaryllis Belladonna* upon it, but confused with it the literature relating to *Hippeastrum equestre*.

If this view is rejected, we are left with the alternative that the name *Amaryllis Belladonna* was based only on the American plant *Hippeastrum equestre*, known to Linnaeus in cultivation and from the literature. The difficulties that arise when one attempts to reconcile this alternative with the evidence detailed above, will be readily discernible.

Now regarding the identification of *Amaryllis Belladonna* L., it seems that the four following views are possible :—

(1) We can reject entirely the suggestion that the Cape Belladonna formed part of *Amaryllis Belladonna* L. in 1753, and say that only *Hippeastrum equestre* is concerned. This is Uphof's conclusion.

(2) We may consider that Linnaeus based *Amaryllis Belladonna* on the literature he cited, i.e., on *Hippeastrum equestre*, that he misidentified with it the Cape Belladonna known to him as a garden plant, and took the characters for the diagnosis, at least in part, from the garden plant.

(3) We can consider that Linnaeus based *Amaryllis Belladonna* on the Cape Belladonna known to him as a garden plant, and misidentified with it the literature belonging to *Hippeastrum equestre*.

(4) We may agree that Linnaeus confused the Cape Belladonna and the literature concerning *Hippeastrum equestre* under *Amaryllis Belladonna* but consider that there is not sufficient evidence to show that either species has a better claim than the other to the name *Amaryllis Belladonna* L.

With regard to these four possibilities I would remark as follows :—

(1) In my opinion the evidence as a whole, and particularly that under (b), (d), and (e), and to a less extent that under (c), (f) and (h) makes this view so improbable that it must be rejected.

(2) and (3) These being alternatives may be considered together. It seems much more likely that Linnaeus would have had chiefly in mind the garden plant from which he took his diagnosis, and would have misidentified with it the literature connected with another species, rather than *vice-versa*. The diagnosis is so incompatible with the species represented by the literature, that there is no justification for giving the literature precedence as the basis for the name *Amaryllis Belladonna*. Consequently I think that (3) is the more reasonable view. As to the type of the name *A. Belladonna*, this will be the plant from which Linnaeus took his diagnosis, or specimen thereof if one exists. The specimen of the Cape Belladonna in the Clifford Herbarium may actually be the type, but unfortunately this cannot be proved. However, in the absence of evidence to the contrary this specimen may be accepted as the working type.

(4) In my opinion the evidence points to view (3) being preferable to this, and consequently I accept (3) and reject (4). However, this view might be accepted by other workers, in which case a lectotype of the name *A. Belladonna* would have to be chosen. As the "Regulations for determining types," mentioned in the International Rules of Botanical Nomenclature ed. 3 (1935), have not yet appeared, the choice of a lectotype should be governed by the general principles upon which the Rules are based. The first essential point in nomenclature is to aim at fixity of names (Art. 4), and in the absence of a relevant rule established custom must be followed (Art. 5). The first author to restrict the name *A. Belladonna* to one of its two elements and definitely to exclude the other, was L'Héritier, who in 1788 restricted the name *A. Belladonna* to the Cape Belladonna, excluding the literature. The same treatment was adopted independently by the younger Linnaeus in MS. 1781–83, though his work was not published until 1789. This treatment has been accepted without question for the past hundred years. We may therefore say that the name *A. Belladonna* should be retained for the Cape Belladonna, and the specimen in the Clifford Herbarium may well be accepted as the lectotype.

III. The Typification of the Generic Name Amaryllis L.

Linnaeus included nine species in *Amaryllis* in the first edition of his "Species Plantarum," and these nine species belong to as many different genera according to modern concepts.

No one species has a better claim than the others to be regarded as the type of the generic name, and in fact Linnaeus indicated the wide limits of his concept of the genus when he stated (in his "Genera Plantarum," Ed. 5, p. 142: 1754) "Inflexia petalorum, staminum, and pistilli in hoc genere admodum diversa est."

In the absence of rules for typification, the choice of one of the original species as the type of *Amaryllis* is governed by the general

principles underlying the rules. It has been the general practice from 1821 to the present day to retain the name *Amaryllis* for *A. Belladonna* L. (the Cape Belladonna), and accordingly that species " the only one of the nine original species now retained in the genus," was suggested as the standard-species for *Amaryllis* by Hitchcock and Green (Internat. Bot. Congr. 1930, Nomencl. Prop. Brit. Bot. 145 : 1929). In 1935 the Sixth International Botanical Congress recommended " that the standard-species (species lectotypicae) of Linnaean generic names printed in International Rules, ed. 3, pp. 139–143, be adopted by botanists unless there is clear reason for rejecting any species in favour of another."

We have therefore to trace the history of *Amaryllis* from 1753 onwards in order to discover whether or not any clear reason exists for rejecting *A. Belladonna* as the lectotype.

Between the time of the publication of " Species Plantarum " in 1753, and the year 1819, five new genera of *Amaryllidaceae* were established, to each of which one of the original *Amaryllis* species is referable. These genera are :—

Brunsvigia Heister to which is referable *A. orientalis* L.
Imhofia Heister ,, ,, ,, ,, *A. sarniensis* L.
Sprekelia Heister ,, ,, ,, ,, *A. formosissima* L.
Atamasco Adanson ,, ,, ,, ,, *A. Atamasco* L.
Sternbergia Waldst. & Kit. ,, ,, *A. lutea* L.

In no case, however, was the establishment of a new genus accompanied by a revision of the limits of *Amaryllis*.

The first effort to distinguish the various elements that Linnaeus had included within *Amaryllis* was made by Herbert in 1819, in the Botanical Magazine, sub t. 2113, who distributed the elements of *Amaryllis* L. Sp. Pl. (1753) thus :—

A. zeylanica was placed in *Crinum* L.
A. sarniensis was referred (along with other species) to a new genus, *Galatea* Herbert.
A. orientalis (under the name *A. multiflora*) and *A. Belladonna* (the Cape Belladonna) were placed with other species in a new genus *Coburgia* Herbert.
A. longifolia (under the name *A. falcata*) was tentatively referred to *Brunsvigia* Heister.
A. formosissima and *A. Atamasco* were left in *Amaryllis*, the latter species being doubtfully included.
A. lutea and *A. guttata* were not accounted for, though the latter may have been included in the *A. ciliaris* which was doubtfully referred to *Coburgia*.

Incidentally it may be noted that Herbert regarded *A. Belladonna* as the Cape plant, and recognized *A. equestris* Linn. fil. as a distinct species which he retained in *Amaryllis*. Under *A. equestris* the younger Linnaeus had cited Merian's figure which was one of the original elements of *Amaryllis* L. (1753), having been cited by Linnaeus under *A. Belladonna*. Hence Herbert actually retained in

Amaryllis three of the original elements of that genus, namely, *A. formosissima*, Merian's figure (now referred to *A. equestris*), and *A. Atamasco*. Of these, *A. Atamasco* was included with a query and the remark that it might have to be separated as a distinct genus; for purposes of typification it may therefore be excluded, and the two other elements alone have to be taken into account. Herbert did not indicate either of them as type, and therefore we may say that he did not choose a lectotype of the generic name *Amaryllis*, either explicitly by specific mention, or implicitly by including only one of the original elements in the genus. For purposes of typification, therefore, his treatment of *Amaryllis* in 1819 need not be taken into account.

It should be mentioned, however, that Herbert gave a description of *Amaryllis* in 1819 and that this description does not cover *A. formosissima* since that species differs in one very important particular. Herbert says "Tube of the corolla outwardly a funnel-shaped continuation of the limb . . . ." but the corolla of *A. formosissima* has no tube, the perianth-segments being free right to the ovary, and, moreover, they spread apart at the base and do not connive there to form a false tube. The description given by Herbert covers, and was evidently taken from, the other eight species which he placed without question in *Amaryllis*, so that the genus as defined by him contained

(1) *A. formosissima* L., one of the original species of the genus, but which does not agree with Herbert's generic description;

(2) 8 *other species* (including *A. equestris*), to which Herbert's generic description applies.

Actually (2) represents a genus distinct from (1), a fact which Herbert recognized two years later when he proposed a new genus, *Hippeastrum*, for it, and treated *A. formosissima* as the sole species of another genus, *Sprekelia* Heister.

That Herbert's conception of *Amaryllis* in 1819 was based primarily on the *Hippeastrum* species, is clear from his remark on p. 144 of his Amaryllidaceae (1837), where, under *Hippeastrum*, he says "Many years ago, when . . . . I first distinguished this genus from the plants with which it had been confounded, I retained for it the name *Amaryllis* . . . ." In 1819, however, Herbert was evidently unaware that *A. formosissima* was generically distinct from the other species he had placed with it in *Amaryllis*, and that it did not agree with his generic description. It might be argued that Herbert had implicitly typified *Amaryllis* by supplying a revised generic description which is now known to fit only one of the original elements of *Amaryllis*. Such an argument, however, shows confusion of thought between a type-species of a generic name and a typical species of a genus. If the type-species should happen to be a morphologically aberrant species, as compared with the rest of its congeners, it will obviously not agree with a description drawn up from the more typical species. Consequently we cannot

argue in this case that, because *A. equestris* was a typical species of *Amaryllis* as that genus was defined by Herbert in 1819, it was therefore implicitly chosen by him as the lectotype of the generic name.

Two years after the publication of his work in 1819, Herbert produced the famous "Appendix," in which he corrected and altered his earlier work in several respects. In the "Appendix" the original species of *Amaryllis* were distributed as follows :—

Linnaean name.	Genus to which Herbert referred the species.	Name under which the species appeared in Herbert's Appendix.
A. Belladonna L. pars typica (the Cape Belladonna)	*Amaryllis* ...	*A. Belladonna* Bot. Mag. 733.
A. Belladonna L. quoad literat.	*Hippeastrum* ...	*H. equestre* Bot. Mag. 305.
A. orientalis L.	*Brunsvigia* ...	*B. multiflora* Bot. Mag. 1619.
A. sarniensis L. ...	*Nerine* ...	*N. sarniensis* alias *Venusta*, var. 3. Bot. Mag. 294.
A. zeylanicum L. ...	*Crinum* ...	*C. zeylanicum* Bot. Mag. 1171.
A. formosissima L. ...	*Sprekelia* ...	*S. formosissima* Bot. Mag. 47.
A. Atamasco L.	*Zephyranthes* ...	*Z. Atamasco* Bot. Mag. 239.
A. lutea L.	*Oporanthus* ...	*O. luteus* Bot. Mag. 290.
A. longifolia L.	*Ammocharis* ...	*A. falcata* Bot. Mag. 1443.
A. guttata L.	*Boophone* ...	*B. ciliaris* quoad "Specimen in herb. Banks."*

It will be seen at once that this arrangement disposes of all the original elements of *Amaryllis* L. (1753) and retains only *A. Belladonna* (the Cape Belladonna) in the genus. This, therefore, was the first choice of a lectotype for the generic name *Amaryllis*.

In the 1821 arrangement, it will be observed, *A. formosissima* was placed in *Sprekelia*, most of the other species of *Amaryllis* L. emend. Herbert (1819) were included in a new genus *Hippeastrum*, and the name *Amaryllis* was retained for *A. Belladonna*, a species which in 1819 had been referred with four others to a new genus *Coburgia* Herbert.

The reason for this *volte-face* was given by Herbert some years later in Amaryllidaceae, 144–145 (1837). The passage is too long to quote, but it should be observed that parts of it are inaccurate.† It shows, however, that Herbert's change of mind came about through the construction which he placed on the observation which Linnaeus made in Hortus Cliffortianus, 135, and which is reproduced in full on p. 52 of this article. From Herbert's remarks it is clear that he interpreted this as showing that when Linnaeus proposed

* In Amaryllidaceae, 240 (1837) Herbert refers this specimen to *Boophone guttata* and maintains that species as a species distinct from *B. ciliaris*.

† As for example when Herbert states that *Coburgia* was established in Trans. Hort. Soc., whereas it was first proposed in the Bot. Mag. sub t. 2113.

the name *Amaryllis* to replace *Lilio-narcissus* of Tournefort, he had primarily in mind the well-known Belladonna of gardens (that is, the Cape plant), and Herbert goes on to say : " It was the exquisite blending of pink and white in that flower, as in the female complexion, that suggested the common name in Italy, and to those lovely tints Linnaeus referred, when he assigned to it the name of a beautiful woman. To suppose he would have alluded to a bright orange flower would be perfectly absurd. It is therefore quite indisputable that Belladonna is the type of the Linnaean genus *Amaryllis*, and it would be an idle insult to the memory of Linnaeus to remove it without any cause."

Strangely enough, Herbert says that *Amaryllis Belladonna* (that is, the Cape Plant) was not one of the species defined in the " Hortus Cliffortianus," and he seems to have been unaware that the second species in that work was precisely the one that Linnaeus named *A. Belladonna* in his Species Plantarum. Herbert says that at the time he first revised the genus *Amaryllis* and referred *A. Belladonna* to *Coburgia*, he did not know of Linnaeus's note in the " Hortus Cliffortianus," but that as soon as he learnt of this note he felt that the name *Amaryllis* ought to have been retained for *A. Belladonna*, and consequently he transferred the name to that species in his " Appendix."

It is clear that during the years 1819 to 1821 Herbert was working to bring order out of the chaos which enveloped the genera of the *Amaryllidaceae*, and it was not until 1821 that he himself reached reasonably satisfactory conclusions regarding the genera of the family. These conclusions were embodied in his " Appendix," and succeeding workers have naturally followed the arrangement in that publication, and ignored the earlier and less complete work. Actually the " Appendix " forms the basis upon which all succeeding taxonomy and nomenclature of the family rests, and this has already received recognition by the conservation of *Zephyranthes* Herbert (1821) against *Atamasco* Adanson (1763), and *Nerine* Herbert (1820) against *Imhofia* Heister (1753 and 1755).

It appears that no reason exists for rejecting Hitchcock and Green's choice of *A. Belladonna* as the standard-species (lectotype) of *Amaryllis* and it should therefore be accepted.

IV. The Correct Name for Hippeastrum.

The generic name *Hippeastrum* Herbert dates from Herbert's " Appendix," published December (?) 1821, where it was proposed for a number of plants previously included in *Amaryllis* L.

Two years previously (Bot. Mag. t. 2113) Herbert had retained a number of these plants in *Amaryllis* along with a generically distinct plant *A. formosissima*. As shown in section III of this paper, however, the name *Amaryllis* must be retained for *A. Belladonna* and cannot be applied to *A. formosissima* or to the other species.

In the Bot. Mag. article already mentioned, Herbert proposed a new genus *Coburgia* to which he referred five species, enumerated

thus: 1. *C. blanda* Bot. Mag. 1253*; 2. *C. Belladonna* Bot. Mag. 733; 3. *C. pudica* Ker; 4. *C. reticulata*; 5. *C. multiflora* Bot. Mag. 1619. These belong to three different genera as now understood, nos. 1–3 to *Amaryllis* (the Cape plant), no. 4 to *Hippeastrum* and no. 5 to *Brunsvigia*. In addition Herbert mentioned a number of other species which might also be referred to the genus. In a footnote Herbert said that *C. reticulata* might, in certain circumstances, have to be made a distinct genus, for which he suggested the name *Leopoldia*. The latter is, however, clearly a *nomen provisorium* and has no standing whatsoever at this date (Dec. 1st 1819, date on plate). Moreover, in a later article in the same volume of the Botanical Magazine, sub t. 2124, p. 2 (Jan. 1st 1820, date on plate) Herbert has a footnote "*Reticulata* may decidedly rank as COBURGIA," which cancelled his earlier note. A little later in the same year Herbert apparently changed his mind about *reticulata*, for in a letter to the Secretary of the Horticultural Society, dated March 20, 1820, and which was read to the Society on April 4th, 1820, and subsequently published in the Transactions, **4**, 176–184, Herbert says:—"Leopoldia reticulata and striatifolia,§ [§Amaryllis reticulata Bot. Mag. 657. And var. striatifolia Bot. Mag. 2113, and Bot. Reg. 352. Leopoldia reticulata and striatifolia Bot. Mag. 2113, p. 5.] which are two distinct species of a separate genus, approaching to Coburgia in the seed, and to Amaryllis in the flower, require the stove, and will not thrive with much of the bulb above ground." The part in square bracts appeared in the original as a footnote. It is clear that in this place Herbert definitely proposes the genus *Leopoldia*, with *L. reticulata* and *L. striatifolia* as the only species. The only question that arises is whether or not the generic name was validly published. Herbert's remarks concerning *Coburgia* and *Amaryllis* obviously mean (1) that *Leopoldia* has fleshy seeds like *Coburgia* (which it has) and differs in this respect from *Amaryllis*, which Herbert described in Bot. Mag. t. 2113, p. 3 as having "Seeds flat, shining black, winged," and (2) that *Leopoldia* had flowers like *Amaryllis* and not like *Coburgia*, the effective differences, as defined by Herbert in Bot. Mag. sub t. 2113, being that in the latter the stamens were alternately longer and shorter, whereas in the former they were not. In this respect *Leopoldia* agrees with *Amaryllis*. Herbert's statement, however, is by itself scarcely sufficient to rank as a "description" of the genus. Herbert also gave a direct reference to *Leopolida* in Bot. Mag. t. 2113, p. 5, where he had said "If *reticulata* be really a native of Brasil . . . . I conjecture that it will be found to form by itself a genus distinguishable from Coburgia by a complete union of the outer laciniae to the tube, and non-alternation of the filaments: in which case I should separate it from Coburgia under the name of *Leopoldia reticulata*, and consider the white-lined sort as a separate species,

* This is obviously an error; t.1253 is *Amaryllis ornata* Linn. fil. sec. Ker Gawl. (i.e. *Crinum distichum* Herb., *fide* Baker). *A. blanda* appears in the Bot. Mag. t. 1450.

viz., *striatifolia*. I am unable to state whether the filaments of *reticulata* are alternate or not, which would at once decide whether it be a Coburgia or distinct genus." The fact that Herbert definitely accepted it as a distinct genus in the Transactions seems to show that he had discovered that the filaments were not alternate (they are not) and that he considered the distinctions mentioned in the Bot. Mag. were correct and that *Leopoldia* was distinguished from *Coburgia* by the characters mentioned.

Article 42 of the Rules reads : " A name of a genus is not validly published unless it is accompanied (1) by a description of the genus, or (2) by the citation of a previously and effectively published description of the genus under another name ; or (3) by a reference to a previously and effectively published description of the genus as a subgenus, section, or other subdivision of a genus," and it is clear that the publication of *Leopoldia* does not conform either to the first or to the third alternative, and does not strictly come under the second. Herbert's reference to Bot. Mag. 2113, p. 5 is certainly to a previous and effectively published description of the genus, but it is not under another name, being, in fact, under the same name, *Leopoldia*, which appeared as a *nomen provisorium* in the Bot. Mag. It is evident, however, that the essential part of article 42 (2) is the citation of a previous and effectively published description, and the possibility of that description having appeared *under the same name*, published as a *nomen provisorium*, was overlooked. Having regard to the obvious intention of article 42, the citation of p. 5 of Bot. Mag. t. 2113 by Herbert may be regarded as validating the name *Leopoldia*.

Thanks to the researches of Mr. W. T. Stearn of the Lindley Library, it is possible to give the date of publication of *Leopoldia* as January 29th or the early days of February 1821, for although the title-page of the volume bears the date 1822, the volume was issued in parts, and Herbert's letter is in part 2, which, Mr. Stearn states (in litt.), appeared Jan. 29–Feb. 1821.

Later in the same year Herbert issued the " Appendix," which Mr. Stearn states (in litt.) was probably published in December, and certainly after May 1st, for in it are references (p. 24) to Bot. Mag. t. 2231 and (p. 23) to Bot. Reg. t. 546, both of which are dated May 1st, 1821. In the " Appendix " Herbert continued to treat *reticulata* and *striatifolia* as a distinct genus—for which, however, he used the name *Coburgia* instead of *Leopoldia*—whilst he established a new genus, *Hippeastrum*, for certain other species.

As mentioned above, the genus *Coburgia* Herbert was first proposed in 1819 with five species. No nomenclatural type was indicated by Herbert, nor is there anything in the original place of publication to show that any one species has claims to be regarded as the type. *C. reticulata*, however, may be excluded from consideration, since it was assigned to the genus with some doubt, and this limits the choice of lectotype to the other four original

species.* Consequently the name *Coburgia* should not be applied to *reticulata* and *striatifolia* as was done in the " Appendix." Herbert evidently argued that since he had referred four of the original species of *Coburgia* to other genera (*C. blanda, C. pudica* and *C. Belladonna* to *Amaryllis* and *C. multiflora* to *Brunsvigia*), he was at liberty to use the name *Coburgia* for *C. reticulata*.

Three years after the publication of the " Appendix," Herbert became convinced that *reticulata* and *striatifolia* could not be maintained as generically distinct from *Hippeastrum*, whereupon, in Bot. Mag. sub t. 2475 (date on plate April 1, 1824), he united them with that genus under the name *Hippeastrum*. Now the use of *Hippeastrum* for the resulting genus was wrong, for the generic name *Leopoldia* Herbert (Jan. 29–Feb. 1821), which had been proposed for *reticulata* and *striatifolia*, antedates *Hippeastrum* Herbert (Dec. 1821). Accordingly, when *reticulata* and *striatifolia* were united with *Hippeastrum* in 1824, the name *Leopoldia* should have been adopted for the resulting genus. Consequently the correct name for *Hippeastrum* Herbert, under the Rules, is *Leopoldia* Herbert.

The substitution of *Leopoldia* for *Hippeastrum* to-day, however, would necessitate the making of new combinations for all the species of *Hippeastrum* except *H. reticulatum*, changes which would cause great inconvenience and loss of time to all concerned. It was precisely with such cases in view that the conservation of particular generic names was authorized under the International Rules, Art. 21, and the generic name *Hippeastrum* is therefore proposed for conservation. The grounds for this proposal are as follows :—

(1) The genus consists of about seventy species, many of which are well known in cultivation.

(2) The name *Hippeastrum* has been in general use for the genus for over a hundred years (1821–1938). During that period it has been adopted in nearly all monographs and floristic works, among which the following may be mentioned :—

Herbert, Appendix (1821) ; Herbert, Amaryllidaceae (1837) ; Kunth, Enum. V. (1850) ; Baker in Journ. Bot. XVI (1878) ; Hemsley, Biol. Centr.-Amer. Bot. III (1882–86) ; Bentham & Hooker f., Gen. Pl. III (1883) ; Nicholson, Illustr. Dict. Gard. (1884–88) ; Baker, Handb. Amaryll. (1888) ; Engler & Prantl, Nat. Pflanzenfam. (1888) ; Donnell Smith, Enum. Pl. Guatemal.

* Of these, *C. blanda, C. pudica* and *C. Belladonna* are generally regarded as conspecific and take the oldest epithet *Belladonna*, so that the choice for the lectotype actually lies between *C. Belladonna* and *C. multiflora*. There is, however, evidence that *C. Belladonna* (sens. ampl.) was actually the type of the generic name, for in his Amaryllidaceae, p. 144, Herbert says " Many years ago, when . . . . . I first distinguished this genus [Hippeastrum] . . . . I retained for it the name Amaryllis, and proposed that of Coburghia for Belladonna and Blanda," and, referring to the fact that Sweet had proposed Belladonna as a generic name for *A. Belladonna* and *A. blanda*, and had proposed a new specific epithet for the former, Herbert says " This was doubly wrong, for with his view he ought to have adopted the proposed name Coburghia." It seems clear that Herbert regarded *Coburgia* as founded upon *A. blanda* and *A. Belladonna*.

(1889–1907) ; Philippi, Pl. Nuevas Chil. (1896) ; Dyer, Fl. Trop. Afr. (1898) ; Dalla Torre & Harms, Gen. Siphonog. (1901) ; Urban, Symb. Antill. (1903–1921) ; Rendle, Classif. Flow. Pl. (1904) ; Ascherson & Graebner, Synopsis III (1906) ; Pulle, Enum. Vasc. Pl. Surinam (1906) ; Boldingh, Fl. Dutch West Ind. Isl. (1909 14) et Fl. Nederl. West Ind. Eil. (1913) ; Bailey, Stand. Cycl. Hort. (1915) ; Haumann & Vanderv. Cat. Phanerog. Argent. (1917) ; Britton, Fl. Bermuda (1918) ; Standardized Pl. Names (1923) ; Bailey, Man. Cult. Pl. (1924) ; Rendle, Classif. Flow. Pl. ed. 2 (1930) ; Small, Man. Southeast Fl. (1933) ; Hutchinson, Fam. Flow. Pl. II (1934) ; Macbride, Fl. Peru (1936) ; Standley, Fl. Costa Rica (1937).

The name *Hippeastrum* has, in fact, been used in practically all botanical and horticultural literature since 1837, and nearly all illustrations of the genus that have appeared since that year will be found under that name.

V. Conclusions.

As a result of a fresh investigation into the identity of *Amaryllis Belladonna* L., it has been shown that this species was not based exclusively on the American plant now known as *Hippeastrum equestre*, as Uphof has stated, but was actually based on a plant of the Cape Belladonna (currently known as *Amaryllis Belladonna*) with which was confused the literature relating to the American plant ; consequently the name *Amaryllis Belladonna* cannot be used for the American plant.

With regard to Uphof's conclusions that the genus *Hippeastrum* Herbert should be renamed *Amaryllis* L., and that the Cape Belladonna must be renamed *Callicore rosea* Link, it has been demonstrated that the name *Amaryllis* must be retained for *A. Belladonna* (the Cape plant), and that under the Rules the correct name for *Hippeastrum* is *Leopoldia* Herbert. However, since the adoption of the latter name would cause considerable inconvenience to botanists and horticulturists alike, it has been proposed that *Hippeastrum* Herbert should be placed on the list of *Nomina Generica Conservanda*.

VIII—NOTES ON STREPTOCARPUS. B. L. Burtt.

The genus *Streptocarpus* has attracted a good deal of attention in recent years ; it has been studied from the standpoint of its seedlings* and has been in use for some time in genetical and biochemical investigations at the John Innes Horticultural Institution, Merton. During this time a taxonomic study of the genus has been made at Kew and the more important points that have come to light are referred to in the following notes. I am greatly indebted to Mr. W. J. C. Lawrence, who is in charge of the

* A. W. Hill, The monocotylous seedlings of certain dicotyledons with special reference to the Gesneriaceae. Ann. Bot. New Series, **2**, 127 (1938).

work on *Streptocarpus* at Merton, for his help in considering the affinities of certain species and for supplying living material of many of them. Miss I. C. Verdoorn of the Division of Plant Industry, Pretoria, visited Kew early in 1938 and the opportunity was taken to discuss a number of the problems affecting the South African species; since her return to Pretoria she has kindly sent over a number of interesting specimens for examination and also seed of several species, which it is hoped will flower at Kew next year. I must also thank Mr. P. J. Greenway of Amani for the benefit of his first hand knowledge of the East African species. In Germany Dr. F. Oehlkers of Freiburg has been working on problems of cytoplasmic inheritance in *Streptocarpus** and a new species, proposed by Dr. Mansfeld of Berlin, was published in his paper. We are indebted to Dr. Oehlkers for sending to Kew a living plant of this species, *S. Comptonii* Mansfeld.

No attempt is made in the present paper to reclassify the genus as a whole, but one or two observations on its primary classification may be made. The arrangement of the genus now in general use is into three equivalent sections, *Unifoliati*, *Rosulati* and *Caulescentes*. This was first proposed by Fritsch in 1893† and was adopted by C. B. Clarke in the Flora Capensis‡ and by Clarke and J. G. Baker in the Flora of Tropical Africa.§ By 1904, however Fritsch‖ had recognised the deeper gulf separating *Caulescentes* from the other two sections and had therefore raised it to the rank of a subgenus, which he called *Streptocarpella*: the sections *Unifoliati* and *Rosulati* were combined to form another subgenus, *Eustreptocarpus*. There can be little doubt that Fritsch's later classification gives a much truer representation of the affinities of these groups. The break between *Streptocarpella* and *Eustreptocarpus* is a very real one, unbridged by any species yet known and it is further emphasized by complete sterility between species not of the same subgenus. There is also a difference in the chromosome numbers, which have been determined at Merton: in *Streptocarpella* 2n=30, in *Eustreptocarpus* 2n=32.

On the other hand there does not seem to be a hard and fast line between *Unifoliati* and *Rosulati*. For instance in some states *S. rhodesianus* and *S. Pole-Evansii* look like unifoliate species, though other specimens of the former and Miss Verdoorn's observations on living plants of the latter show that they are really rosulate-leaved. It is not certain, however, that their growth morphology is fully equivalent to that of the *S. Rexii* group which is distinguished

* F. Oehlkers, Bastardierungsversuche in der Gattung Streptocarpus Lindl. 1. Plasmatische Vererbung und die Geschlechtsbestimmung von Zwitterpflanzen. Zeitschrift für Botanik, **32**, 305 (1938). This paper includes an interesting account of the characteristic *Streptocarpus* inflorescence.

† K. Fritsch, Gesneriaceae in Engler & Prantl, Natürl. Pflanzenfam. **4**, 3B, 151 (1893).

‡ Dyer, Flora Capensis **4**, sect. 2, 438 (1904).

§ Dyer, Flora of Tropical Africa **4**, sect. 2, 504 (1906).

‖ K.Fritsch, Die Keimpflanzen der Gesneriaceen, 158 (1904).

by its more numerous leaves and few-flowered inflorescences. Further investigation may well show that a more satisfactory subdivision of *Eustreptocarpus* can be made if the character of unifoliate or rosulate habit is relegated to a position of secondary importance.

In the following notes the species are arranged alphabetically under the two subgenera.

SUBGENUS EUSTREPTOCARPUS.

S. Bolusi *C. B. Clarke* in Dyer, Fl. Cap. **4**, sect. 2, 445 (1904).

TEMBULAND. Engcobo Mts., 1350 m., 17 Jan. 1896, *H. Bolus*; 16 Jan. 1896, *Flanagan* 2749.

GRIQUALAND EAST. Rocky places near Maclear, 1350 m., 29 Jan. 1896, *H. Bolus*.

Clarke placed this species in section *Rosulati*, apparently because one of Bolus's specimens has two leaves, but his other specimen and that collected by Flanagan (not seen by Clarke), are unifoliate. Perhaps the second leaf on Bolus's Maclear specimen is the second cotyledon which is known to enlarge occasionally (cf. A. W. Hill in *Ann. Bot.* n.s. **2**, 129, fig. **5** : 1938). In any case *S. Bolusi* does not produce a real rosette of leaves as does *S. Rexii* and other members of the section *Rosulati*, and there is no doubt that it is better referred to *Unifoliati*.

S. breviflos *C. B. Clarke*—see below under *S. Saundersii*.

S. Comptonii *Mansfeld* in Zeitschrift für Botanik, **32**, 327 (1938), et in Fedde, Repert. Spec. Nov. **45**, 64 (1938).

A living plant of this species was kindly sent us by Dr. F. Oehlkers and proved to be the same as an unidentified plant in cultivation at Kew. In both cases the seed had been collected by Dr. E. E. Galpin at Dullstroom in the Transvaal and sent by Dr. R. H. Compton from Kirstenbosch.

S. Comptonii is closely allied to *S. gracilis* B. L. Burtt (Kew Bull. 1937, 514) and these two species form a small natural alliance with *S. polyanthus* Hook. and *S. Haygarthii* N. E. Br. Mansfeld mentions four species, which he thinks are allied to *S. Comptonii*; none of these, however, shows the sharply curved corolla tube with laterally compressed mouth which is characteristic of the *S. polyanthus* group.

S. Comptonii shows a distinct tendency towards cleistogamy, a phenomenon which occurs in some wild caulescent species of *Streptocarpus* and in a cultivated form of *S. grandis* (see below), but it is not yet known to occur in the wild in species of *Eustreptocarpus*. The chief differences between *S. Comptonii* and *S. gracilis* are the smaller, paler flowers and shorter inflorescence of the former.

S. cyaneus *S. Moore*—see below under *S. Rexii*.

S. Gardeni *Hook.*—see below under *S. Rexii*.

S. Goetzei *Engl.* in Engl. Bot. Jahrb. **30**, 406 (1901). *S. rungwensis* Engl. in Engl. Bot. Jahrb. **57**, 217 (1921).

Tanganyika Territory. Tukuyu District: outer S. slope of crater wall of Wentzel-Heckmann Lake, 2160–2350 m., 7 March 1932, *St. Clair-Thompson* 663. Rungwe, 19 Dec. 1911, *Stolz* 1040; 17 Feb. 1912, *Stolz* 1121.

Nyasaland. 1891, *Buchanan* 108, 882, 1088. Shiré Highlands, *Buchanan* 99.

The species of *Streptocarpus* to be found in the mountains around and near Lake Nyasa are not yet sufficiently well known to permit of a satisfactory classification. *S. Goetzei* and *S. rungwensis* are scarcely separable from a study of herbarium specimens and are best united under the former name. Both have shortish (2·5–3 mm.) calyx-segments, and in this they differ from *S. Mahoni* Hook. f. in which the calyx-segments are 6 mm. long. *S. Mahoni* is still only known from the type material grown at Kew in 1900. There appears to be at least one other species in Nyasaland, represented in the Kew herbarium by a fragmentary specimen from Namasi: further material is necessary before it can be identified.

S. grandis *N. E. Br.* in Bot. Mag. t. 8042 (1905).

This fine species has been in continuous cultivation since its original introduction, though no further specimens collected in the wild have reached Kew.

Two white-flowered forms of this species are known. One has normal chasmogamous flowers and may be an albino of wild origin. The other is a stunted plant, which often bears malformed inflorescences and cleistogamous flowers. It has been grown under the name *S. Saundersii*, but it is certainly only an abnormal form of *S. grandis*.

S. Haygarthii *N. E. Br. ex C. B. Clarke* in Dyer, Fl. Cap. **4,** sect. 2, 440 (1904).

The description of this species in Flora Capensis has caused confusion by the mention of the leaf "the herbarium fragment 26 in. wide." This refers not to *S. Haygarthii* but to *S. grandis*, as has been already pointed out by N. E. Brown (Bot. Mag. t. 8042).

The flowers have been described by collectors as "pale blue" or "lilac," but a form grown at Merton had deep cobalt-violet flowers. In all other respects it agreed with the wild specimens of *S. Haygarthii*. As a horticultural subject it is disappointing, for though a plant may remain in flower for a long time, there are seldom more than one or two flowers expanded together.

S. hirtinervis *C. B. Clarke* in Dyer, Fl. Cap. **4,** sect. 2, 446 (1904), quoad descr., et in Dyer, Fl. Trop. Afr. **4,** sect. 2, 507 (1906).

Nyasaland. Mt. Mlanji, 2100–2700 m., Dec. 1900, *Purves* 91 (type). Mt. Malosa, 1200–1800 m., Nov.-Dec. 1896, *Whyte*.

Although the species was first published in Flora Capensis, Clarke there states that the description was taken chiefly from the Nyasaland specimens and he has definitely labelled *Purves* 91 as the type. He associated with this species a specimen collected by H.

Bolus at Chwenka in Griqualand East, but this unfortunately was an error of judgment. Bolus's specimen lacks both the densely silky-villous indumentum and the saccate corolla-base that are characteristic of true *S. hirtinervis* ; the saccate corolla-base, which is its most interesting feature, was not even mentioned by Clarke either in Flora Capensis or in the Flora of Tropical Africa. *S. hirtinervis* is, then, a species endemic in Nyasaland and the record of its occurrence in South Africa must be erased. Bolus's Chwenka specimen, it may be mentioned, is probably a very small specimen of *S. polyanthus* Hook.

S. Junodii *Beauverd*. This is a synonym of *S. cyaneus* : see under *S. Rexii*.

S. luteus *C. B. Clarke*—see under *S. parviflorus*.

S. Michelmorei *B. L. Burtt* ; species nova *S. grandi* N. E. Br. affinis, floribus pluribus saturatius caeruleis fauce luteis, corollae lobis majoribus distinguenda. *S. Mahoni* Hook. f. etiam accedit sed inflorescentiis altioribus, corollis fauce luteo-notatis, filamentis eglandulosis, fructibus longioribus facile distinguitur.

Herba acaulis, unifoliata. *Folium* ultra 30 cm. longum attingens, apice mox emarcidum, usque 30 cm. latum, ovatum, basi subcordatum, margine obtuse crenulato-serrulatum, utrinque breviter pubescens, nervis lateralibus c. 20 ut costa subtus prominentibus carnosis. *Inflorescentiae* usque 30 cm. altae, serie acropetala productae, multiramosae. *Flores* numerosi subpenduli per paria cymose dispositi, saturate caerulei, circum faucem purpurei et in fauce luteo-notati. *Pedicelli* usque 2·5 cm. longi, pubescentes. *Calyx* ad basin 5-partitus, lobis linearibus 5 mm. longis, pubescens. *Corolla* 3 cm. longa, tubo levissime arcuato, ore obliquo aperto c. 8 mm. diametro, lobo anteriore 6 mm. longo et 7 mm. lato, antero-lateralibus et postero-lateralibus 4 mm. longis et 7 mm. latis, omnibus rotundatis, extra breviter pubescens. *Stamina* fertilia 2, 1 cm. supra basin corollae affixa ; filamenta crassa, arcuata, glabra ; antherae reniformes 3 mm. latae, inter se cohaerentes. *Staminodia* 2, 2 mm. longa, clavata. *Discus* annularis, 0·3 mm. altus. *Pistillum* 2·2 cm. longum, dense et brevissime pubescens, stigmate capitato. *Fructus* pubescens, usque 12 cm. longus, spiraliter tortus.

S. Rhodesia. Chipetzana headwaters, 1200 m., *Swynnerton* 1889 (herb. mus. brit.). Melsetter, 1929, *Earthy* 4 (herb. nat. pretor.). Inyamadzi River, near Mt. Selinda, Melsetter, on steep shaded bank of stream, flowers blue, of numerous plants only one in flower, 4 July 1934, *Michelmore* 299—cult. in hort. reg. bot. kew. flor. Mar. 1938 (typus).

Streptocarpus Michelmorei made a fine display when in flower at Kew this spring ; in fact so fine were the plants in comparison with the wild specimen that some doubt as to its origin was entertained and the plant was tentatively determined as a variety of

S. grandis. Further investigation, however, and comparison with a wild herbarium specimen sent on loan from Pretoria (Earthy 4 from Melsetter) have placed the matter beyond doubt and the plant has to be recognised as a fine new species allied to *S. grandis* N. E. Brown, which comes from Natal, but differing in a number of well-marked characteristics (see diagnosis above).

The discovery of *S. Michelmorei* is of considerable interest for it serves to link *S. grandis* geographically and morphologically to *S. Mahoni*, a Nyasaland species. As far as the shape of the corolla is concerned *S. Wilmsii* probably belongs to the same group, but it differs from the other species in having a corolla with spotted markings.

S. Muddii *C. B. Clarke*—see below under *S. Wilmsii*.

S. parviflorus *Hook. f.* in Bot. Mag. t. 6636 (1882). *S. luteus* C. B. Clarke in DC. Monogr. Phan. **5,** pt. 1, 153 (1883).

The confusion which has long existed between these species has never been satisfactorily resolved and a complete re-investigation of the problem has therefore been made.

The first mention of the name *Streptocarpus parviflorus* is in Drège, Zwei Pflanzengeographischen Documenten, where it appeared as a *nomen nudum*, and so it remained until Sir Joseph Hooker figured a plant under this name for the Botanical Magazine (t. 6636 : 1882). This, therefore, was the first valid publication of the name and it is necessary to decide what is to be considered its type. Hooker mentioned three herbarium species which he thought, at that date, were conspecific with the living plant he was illustrating, but he found out later that they were distinct (cf. Bot. Mag. t. 7036 : 1889). These herbarium specimens are the plant which is generally accepted as the one referred to by Meyer's name *S. parviflorus*, though we have already seen that it is Hooker's description and illustration which constitute the first valid publication of that name. Comparison of Hooker's description with his illustration and the herbarium specimens quoted shows conclusively that the description was based on the living plant with the exception that one character, " Capsule one and a half inch long " (given in the English description only), was very probably taken from Bolus's herbarium specimen as no fruits of the living plant were figured. For the rest there are a number of points in the description, the shape and posture of the leaves and the colour of the flower, which definitely exclude the herbarium specimens, while the character of the fruit mentioned above is not diagnostic of either group. We cannot escape the conclusion therefore that the type of *Streptocarpus parviflorus* is the living plant which Hooker figured.

This article was followed in the next year by C. B. Clarke's account of the genus (DC. Monogr. Phan. **5,** pt. 1, 153 : 1883), which was in manuscript when Hooker wrote. Clarke took up the name *S. parviflorus* E. Mey. and provided a description based on the herbarium specimens. Hooker's article in the Botanical Magazine,

however, was published first and it is his plant that must be regarded as the type of *S. parviflorus*. Clarke's species, which we may cite as *S. parviflorus* E. Mey. ex C. B. Clarke—non Hook. f., therefore requires a new name and **S. Meyeri** *B. L. Burtt* is proposed. This name will be validated by the reference to Clarke's description and one of the specimens quoted by him, *Bolus* 389 collected at Graaf Reinet in 1873, is its type.*

The second illustration in the Botanical Magazine under the name *S. parviflorus* was published in 1889 (t. 7036) and the article was also by Sir Joseph Hooker. The plant figured here was raised from seed brought from near Grahamstown and it is the "*S. parviflorus* E. Mey." of Clarke's Monograph and, later, of Flora Capensis. Although the use of the name "*parviflorus*" by Hooker shows that both he and Clarke regarded the plant intended by Meyer as the "type" of the species, Hooker's original description under this name renders such an interpretation impossible under the Rules of Nomenclature.

The next question which arises concerns the status of *S. parviflorus* Hook. f. Hooker himself said (Bot. Mag. sub t. 7036), that it was *S. luteus* C. B. Clarke, but in Flora Capensis Clarke quotes it under his *S. parviflorus* (= *S. Meyeri* above).

S. luteus was based on two specimens, one collected by Nelson near Houtbosch (Woodbush) in the Pietersburg district of the Transvaal, the other collected by Gerrard at a cascade on the Tugela River, Natal. Since Clarke wrote, the species has been recollected in the Houtbosch district but nowhere else and Gerrard's Natal specimen remains its only representative outside that area. Enough is now known of the type of distribution found in *Streptocarpus* to say that such a discontinuous range is highly improbable. On the other hand Gerrard's specimen is not good enough to permit one to say with certainty that it and Nelson's Houtbosch plant represent two distinct species. It seems possible that the Natal plant has a narrower corolla-tube and calyx-lobes tending to be recurved at the tips, but the matter cannot yet be settled. It is to be hoped that Gerrard's plant from the Tugela River will be introduced into cultivation, meanwhile as a precautionary measure it is proposed to designate Nelson 378 as the lectotype of *S. luteus*.

Having settled the application of the names *S. parviflorus* and *S. luteus* we must now consider whether they represent distinct species. It has already been mentioned that Clarke quoted *S. parviflorus* Hook. f. under the species we have just renamed *S. Meyeri*, whereas Hooker considered his *S. parviflorus* equal to Clarke's *S. luteus*. A careful comparison of Hooker's illustration and description of *S. parviflorus* and Clarke's specimens of *S. luteus* fails to show any important difference. Unfortunately indisputable *S. luteus* has not

* The Drège specimen originally named *S. parviflorus* by E. Meyer cannot be taken as the type of the name *S. Meyeri* as it was not amongst those described by C. B. Clarke.

yet been introduced into cultivation and dried specimens in this genus can be very misleading, but in this case there seems to be little doubt that *S. parviflorus* and *S. luteus* are one and the same species. The former name has priority by eighteen months.

Although only published by E. Meyer as a *nomen nudum* "*S. parviflorus*" has been generally attributed to that author and is a good instance of the danger attached to this practice. Had care been taken to discover who published the first valid description the changes in nomenclature now found necessary could have been made long since.

The two species are thus :—

S. parviflorus *Hook. f.* in Bot. Mag. t. 6636 (1882). *S. luteus* C. B. Clarke in DC. Monogr. Phan. **5,** pt. 1, 153 (1883), in Dyer, Fl. Cap. **4,** sect. 2, 445 (1904).

TRANSVAAL. Pietersburg Div. : Houtbosch Berg, on tree-trunk in dense jungle, a lovely gloxinia-like little white flower with yellow throat, rare, *Nelson* 378 (type). Houtbosch, *Rehmann* 5974, 5975, 5976. Debegeni, Woodbush, flowers white, sometimes 2 or 4 dark lines in throat, very occasionally blooms have a faint bluish tinge, 14 Jan. 1938, *v. d. Merwe* 1621.

S. Meyeri *B. L. Burtt*, nom. nov. *S. parviflorus* E. Mey. ex C. B. Clarke in DC. Mon. Phan. **5,** pt. 1, 152 (1883) ; Hook. f. in Bot. Mag. t. 7036 (1889) ; C. B. Clarke in Dyer, Fl. Cap. **4,** sect. 2, 445 (1904) —non Hook. f.

EASTERN CAPE PROVINCE. Albany Div. to Graaf Reinet. Graaf Reinet, in lateribus meridionalibus montium, 1050 m., 1873, *H. Bolus* 389 (type).

S. paucispiralis *Engl.*—see below under *S. rhodesianus.*

S. Pole-Evansii *Verdoorn* in Fl. Pl. S. Afr. t. 678 (1937).

TRANSVAAL. Crocodile Poort, Barberton District, flowered at Irene, Pretoria District, Feb. 1937, *Pole-Evans* 3977. Barberton, under rocks, Jan. 1909, *Thorncroft* (Transvaal Dept. Agric. 2780).

The discovery of Thorncroft's specimen amongst undetermined sheets in the Kew herbarium enables Miss Verdoorn's description to be completed as follows : "*Fruit* 1 cm. long, densely pubescent, the valves twisted through only 3 turns of the spiral."

One of the most interesting characteristics of *S. Pole-Evansii* lies in its production of external granules of a red pigment on the leaves, inflorescences and flowers. The only other species in which this is known to occur is *S. Dunnii*, a point which naturally raises the question whether these two species are not rather closely allied to one another.* The leaf of *S. Pole-Evansii* is not unlike that of

*The pigment of *S. Dunnii* is under investigation at Merton and has been the subject of a letter to "Nature" by J. R. Price and R. Robinson ("A new natural colouring matter of the naphthalene group," Nature, **142,** 147, July 23, 1938), who have named it *dunnione*. The pigment of *S. Pole-Evansii* is not yet available in sufficient quantity for investigation.

S. Dunnii : it is much smaller, but has the same silvery indumentum and conspicuous venation. In both species the fruit is short, but that of *S. Dunnii* is very much stouter than that of *S. Pole-Evansii*, or indeed of any other species. In corolla-shape, however, the two species are very different, *S. Pole-Evansii* having a strongly bilabiate corolla with a long trilobed lower lip and the upper lobes reflexed ; in *S. Dunnii* it is but very slightly bilabiate and all the lobes are spreading and subequal.

Should *S. Dunnii* and *S. Pole-Evansii* be found to be closely related, as a result of further examination of the living plants and their crossing, it will indicate that the form of the corolla may not be an altogether reliable guide to the affinities of the species of *Streptocarpus*.

S. Rexii (*Hook.*) *Lindl.* in Bot. Reg. t. 1173 (1828).
S. Gardeni *Hook.* in Bot. Mag. t. 4862 (1855).
S. cyaneus *S. Moore* in Journ. of Bot. **55,** 172 (1905).

It is convenient to consider these three species together as they were all included under the one name, *S. Rexii*, by C. B. Clarke in Flora Capensis. They are very closely related to one another and form an alliance of species which may be to some extent vicarious, but are not entirely so. They need critical studies in the field before their detailed inter-relationships can be worked out, and the following notes are in many respects tentative.

S. Rexii first became known from specimens and seeds sent home from the Cape by Bowie, the Kew collector, in 1818. It was described in 1827 by Sir W. J. Hooker, who placed it in the Indian genus *Didymocarpus*. *Streptocarpus* was not founded as a distinct genus until the plant was figured by Lindley for the Botanical Register, in the following year. The original specimens were collected in George and Knysna divisions of Cape Province, but further exploration has shown that these are the westernmost localities of a rather wide range which extends through the eastern Cape to Natal and northwards as far as Barberton in the eastern Transvaal.

S. Gardeni was described from a cultivated specimen and a number of differences between it and *S. Rexii* were given. In his treatment of the family for De Candolle's Monographiae Phanerogamarum C. B. Clarke retained *S. Gardeni* as a distinct species, but in Flora Capensis changed his view and reduced it to *S. Rexii*, remarking " I suppose *S. Gardeni* Hook., which I know only from the picture in Bot. Mag. t 4862, to be a fine garden variety of *S. Rexii*." Recently, however, plants exactly agreeing with Hooker's original illustration of *S. Gardeni* have been rediscovered, and it is found that his recognition of *S. Gardeni* as a species distinct from *S. Rexii* is perfectly justified.

Hooker said of *S. Gardeni* " The leaves are longer and handsomer, more ovate in form, more rugose and more wrinkled, and cordate

at the base. The scapes are almost invariably two-flowered, the calyx has the segments patent at their apices. The corolla, though of nearly the same size, is different in form and colour ; uniform pale-blue in *S. Rexii*, here the tube is green or greenish white, and the limb lilac ; moreover the tube is much broader (not suddenly contracted in the lower half), slightly curved downwards ; and the limb, instead of spreading into five nearly equally spreading lobes, is more decidedly two-lipped, the two lobes of the upper lip moderately patent, and the three composing the lower lip porrected or standing forward : the lines on the lower lip, instead of being blue and continuous, are sanguineous, and interrupted in dots or short streaks : the stigma too is different."

Mr. W. J. C. Lawrence has grown *Gardeni* and *Rexii* side by side for two or three years and is convinced that they are distinct species, the differences he recognises being substantially the same as those given by Hooker. His breeding experiments show that *Gardeni* and *Rexii* give different results when crossed with the same species, and that certain characters of *Gardeni*, for instance the more ovate, wrinkled leaves, are nearly always detectable in crosses in which it is concerned. He also tells me that *S. Gardeni* has two lines on its upper petals which are inherited as a dominant character in the species-crosses he has made.

Miss I. C. Verdoorn, working with living plants at Pretoria, had also come to the conclusion that there was a second smaller species allied to *S. Rexii* which she knew from specimens collected near Estcourt, Natal. Until a recent visit to Kew she was unaware that this species was Hooker's *S. Gardeni*, but examination of the Botanical Magazine plate convinced her of their identity.

Lastly a careful examination of the herbarium material has showed that several specimens which can be recognised as *S. Gardeni* by the discontinuous markings on the corolla, were included by Clarke under *S. Rexii*. These species are not easy to separate in dried material but it is very often possible and probably only very imperfect material will be found indeterminable.

The following specimens are referable to *S. Gardeni* Hook. :—

Natal. Without locality, *Sutherland, Gerrard* 763. Umhloti, flowers lilac, February, *Wood* 796. Roxburgh, 1200 m., *Armstrong*. Estcourt, Cathkin Peak, Drakensberg, in wooded kloofs, on rocks and epiphytic, flowers pale mauve, 1200–1500 m., 28 Jan. 1932, *Galpin* 11763.

Orange Free State. Without locality, 1862, *Cooper* 1031.

S. cyaneus S. Moore, the third species in this group, is known from the Eastern Transvaal and Swaziland and is a most perplexing form. Clarke saw a specimen collected by Galpin which he referred to *S. Rexii* with the remark " I suppose it to be a high level form." The salient features of this species are the short corolla tube and the pinkish mauve colour of the corolla. It has been figured in the Botanical Magazine (t. 8521) and in the Flowering

Plants of South Africa (t. 666 as *S. Rexii*). If it is accepted as a distinct species from *S. Rexii* (and Dr. E. P. Phillips of Pretoria does not consider it is so) it is difficult to delimit satisfactorily, for the corolla varies considerably in length, even if always shorter than in *Rexii*, and there may be 1 to 5 flowers on a peduncle. No useful purpose can be served by trying to reach a definite decision at present and the problem is mentioned here chiefly to draw attention to the need of careful studies in the field. It is essential that the relative frequency and variation of the species in the field should be known and that the various forms should be introduced into cultivation for careful study.

S. cyaneus was published in 1905 and thus antedates *S. Junodii* Beauverd (Bull. Herb. Boiss. Sér. II. **7,** 699 : 1907) which proves to be conspecific. *S. Junodii* was described from a cultivated plant raised from seed sent by Junod from Mt. Mamotsuri in the Transvaal (see Bull. Herb. Boiss. Sér. II, **7,** 1013 : 1907). The type specimens of *S. Junodii* have kindly been sent to Kew on loan from the Boissier herbarium and there is no doubt as to its identity with *S. cyaneus*.

There is one other plant of this alliance of which only dried specimens have been seen, but it appears to have a narrower corolla tube than in *S. Rexii* and the flowers are more numerous (3-6 in an inflorescence). The corolla tube has a yellow throat, which also serves to distinguish it sharply from *S. Rexii*, but not from *S. cyaneus* which also shows this character, though whether constant in that species is uncertain. Specimens of this plant have been seen from Graskop (Reynolds 2659), Sabie (Koeleman s. n.) and Tzaneen (v. d. Merwe 1179) but they are not sufficient for description and the species is only mentioned here to call attention to the need for further specimens.

S. rhodesianus *S. Moore* in Journ. of Bot. **49,** 188 (1911). *S. paucispiralis* Engl. in Engl. Bot. Jahrb. **57,** 217 (1921).

N.W. Rhodesia. Katonina Hills, between rocks on hill, 27 Dec. 1907, *Kassner* 2162.

Angola. Moxico Province, Lusavo Falls, in shade of overhanging rocks on hillside in very shallow peaty soil. Leaves flanelly, tips dying against the rock, soft with white hairs ; stems reddish ; calyx whitish, corolla tube dull wine red, lobes white, hairs of throat white, tube inside white spotted with wine red. Jan. 1, 1938, *Milne-Redhead* 4056.

Kassner 2162 is the type number of both *S. rhodesianus* and *S. paucispiralis*.

S. rungwensis *Engl.*—see above under *S. Goetzei*.

S. Saundersii *Hook.* in Bot. Mag. t. 5251 (1861) ; C. B. Clarke in DC. Mon. Phan. **5,** pars 1, 150 (1883) et in Dyer, Fl. Cap. **4,** sect. 2, 443 (1904). *S. Saundersii* Hook. var. *breviflos* C. B. Clarke in DC. Mon. Phan. **5,** pars 1, 150 (1883). *S. breviflos* C. B. Clarke in

Dyer, Fl. Cap. **4,** sect. 2, 443 (1904). *S. tubiflos* C. B. Clarke in Dyer, Fl. Cap. **4,** sect. 2, 441 (1904) p.p.—quoad specimen Woodianum.

Our knowledge of *S. breviflos* is based on a single, very poor, herbarium specimen and a note by N. E. Brown in the Gardeners' Chronicle (III. 375 : 1875). Brown said the plant had been grown by Mr. Saunders of Reigate and that it was " A very distinct variety, having more numerous and smaller drooping flowers, of a delicate waxy white colour, faintly tinged and spotted with lilac, and proved to be really a very charming variety of the parent plant." Unfortunately no herbarium specimens of this plant have been preserved. The specimen quoted by Clarke was collected by Cooper in the Orange Free State ; it is a very poor one and I cannot see why it should be separated specifically from *S. Saundersii* : the corollas present look like some young ones on the sheets of true *S. Saundersii*. Unfortunately both typical *S. Saundersii* and the form noted by N. E. Brown have been lost to cultivation : it may be that the latter will prove distinct from the specimen described by Clarke as *S. breviflos*, but we must await its rediscovery.

Another of the species proposed by Clarke in Flora Capensis which fails to withstand critical investigation is *S. tubiflos*. This was based on two specimens : Wood 572 was originally determined by Clarke as *S. Saundersii* and I have failed to discover why he should have altered this decision ; the specimen is a good match of others included in *S. Saundersii* and should be referred to that species. The other specimen, Gerrard 191, is a fairly good match of the type of *S. Cooperi* C. B. Clarke and undoubtedly belongs to that species.

Clarke referred some Nyasaland plants to *S. tubiflos* in the Flora of Tropical Africa. These do not agree with either of his type specimens but are probably referable to *S. Goetzei* and have already been discussed (p. 70).

A plant which has been passing as *S. Saundersii* in Botanic Gardens is really an abnormal form of *S. grandis* and has been mentioned under that species (p. 71).

S. tubiflos *C. B. Clarke*—see above under *S. Saundersii*. *S. tubiflos* was based on a mixture of *S. Saundersii* and *S. Cooperi*. For notes on tropical African plants referred to *S. tubiflos* (Baker and Clarke in Fl. Trop. Afr. **4,** sect. 2, 506 : 1906) see under *S. Goetzei*.

S. Vandeleuri *E. G. Bak. et S. Moore* in Journ. of Bot. **39,** 262 (1901).

The description of the leaf given by Baker and Spencer Moore is quite unlike that of any other species of *Streptocarpus*, and examination of the type specimen in the British Museum herbarium shows that the leaf in question is a radical leaf of *Berkheya setifera* DC. (*Compositae*). The species has, however, been correctly identified with more complete material from the characters of its inflorescence. Thus, although the species is clearly based on two " entirely discordant elements," there seems no necessity for proposing it as a

nomen confusum (cf. International Rules, ed. 3, Art. 64). The following description of the leaf should replace that in the original description :

" Leaf solitary, more or less cordate at the base, the living part about 15–20 cm. long, 13–20 cm. broad, closely appressed pubescent on both surfaces, crenulate-serrulate on the margins, nerves and midrib prominent below."

S. Wilmsii *Engl.* in Bot. Jahrb. **26,** 363 (1899) ; C. B. Clarke in Dyer, Fl. Cap. **4,** sect. 2, 447 (1904). *S. Muddii* C. B. Clarke in Dyer, Fl. Cap. **4,** sect. 2, 443 (1904).

Transvaal. Umzeila, 1877, *Mudd.* Amongst rocks, summit of Saddleback range, Barberton, flowers white with purple spots in the throat, *Galpin* 822. Spitzkop, Lydenburg, *Wilms* 1025. Mauchsberg, Pilgrims Rest, colour white with purple spots, leaf about 12 inches long, March 1938, *v. d. Merwe* 1649.

When describing *S. Wilmsii* Engler quoted a specimen collected by Wilms but omitted to give the number. Clarke saw a duplicate of Wilms 1025, named *S. Wilmsii*, at the British Museum but came to the conclusion that it did not fit the description of that species and included it under his new species *S. Muddii*. Under *S. Wilmsii*, which he placed as an imperfectly known species, Clarke remarked that the description might do for *S. Galpini*.

The type specimen in the Berlin herbarium, which was kindly sent to Kew on loan, is numbered *Wilms* 1025 and is clearly conspecific with *S. Muddii*, which name it must supersede as it was published some five years earlier.

The fruits of this species were unknown when it was originally described, but we are now able to add the following details from v. d. Merwe 1649 : *fruit* about 9 cm. long, 1·5 mm. in diameter, shortly pubescent, the hairs multicellular and spreading at right angles from the fruit wall.

Subgenus Streptocarpella.

S. bambuseti *B. L. Burtt*, sp. nov. ; ad huc pro varietate *S. glandulosissimi* Engl. habitus, sed corollae tubo longiore, fauce haud clauso, fructu multo breviore facile distinguitur. *S. glandulosissimus* var. *longiflorus* Mansfeld in Notizbl. Bot. Gart. Mus. Berlin, **12,** 95 (1934).

Herba circiter 50 cm. alta, caule pilis multicellularibus glandulosis intermixtis dense obsito. *Folia* opposita, leviter inaequalia, petiolo usque 4·5 cm. longo ut caule piloso et glanduloso ; lamina elliptica, usque 10 cm. longa et 4 cm. lata, apice subobtusa vel acuta, basi cuneata, inaequilateralis, utrinque pilis multicellularibus appresse pubescens, infra rubra, nervis lateralibus utrinsecus circiter 10 ascendentibus. *Inflorescentiae* longipedunculatae, axillares, etiam ex axillis foliorum infimorum orientes. *Pedunculus* infra ramos 6–13 cm. longus, pilis quam in caule brevioribus multicellularibus glandulosis intermixtis dense vestitus. *Flores* in pedicellis glandulosis 1 cm. longis per paria editi. *Calycis* lobi lanceolati 4 mm. longi, subobtusi, dense glanduloso-pubescentes. *Corollae* tubus circiter 2 cm. longus

superne leviter ampliatus; lobi 2 superiores parvi obtuse ovati circiter 6 mm. longi et 5 mm. lati, 3 inferiores multo maioribus . . . . *Fructus* 4 cm. longus, stylo persistente 1 cm. longo incluso, 2·5 mm. diametro, spiraliter tortus.

TANGANYIKA TERRITORY. Nguru Mountains, Mafulumla, c. 2000 m., 9 July 1933, *Schlieben* 4094 (mus. bot. berol.)—" Nebenwald, Kraut vereinzelt im Bambusdickicht. Bl. dunkel blau. Blattunterseite rot. Kiguru: *Pune*. Wurzeln werden gehocht und als Medizin gegen Bauchschmerzen getrunken."

The Uluguru and Nguru Mountains of eastern Tanganyika are evidently a stronghold of *Streptocarpus* and a number of interesting species have already been described from them. It is difficult to see why *S. bambuseti* should ever have been regarded as a variety of *S. glandulosissimus* for, quite apart from the flower size, the fruits are much shorter and broader while the leaves and calyx are also easily distinguishable. Its exact affinity is uncertain, but it is probably more closely allied to *S. euanthus* Mansf. than to *S. glandulosissimus*.

S. Bequaertii *De Wild.*—see below under *S. glandulosissimus*.

S. Buchanani *C. B. Clarke* in Dyer, Fl. Trop. Afr. **4,** sect. 2, 510 (1906). *S. lilacinus* Engl. in Engl. Bot. Jahrb. **57,** 214 (1921).

TANGANYIKA TERRITORY. Im Gebiet des Rungwe um 1450 m. an einem Gebirgsbach, 25 Jan. 1910, *Stolz* 558 (type number of *S. lilacinus* Engl.). Mt. Rungwe, outer south slope of the crater-wall of the Wenzel-Heckmann Lake, " epiphyte with purple flowers and fleshy stem and leaves on tree trunks, often near base and sometimes among moss on rocks at their feet, rare and local," 7 March 1932, *St. Clair Thompson* 664. Undalie, " purple-flowered herb, common in primary forest out of earth catchments round tree stems." 1950 m., 25 Feb. 1933, *Davies* D. 857. Hills north of Lake Nyasa, *Johnson* (comm. *Waller* April 1884).

NYASALAND. Shiré Highlands, " lovely blue," *Buchanan* 410 (comm. Hort. Bot. Edinens. Dec. 1881: type).

Engler had not seen *S. Buchanani* when he described *S. lilacinus*. I have compared the type of Clarke's species with the specimen of Stolz 558 at Kew and can find no significant differences. *S. Buchanani* is the southernmost of the caulescent species and is geographically isolated from its allies, *S. Holstii* and *S. glandulosissimus*, which do not extend south of the Uluguru Mountains. It is closely allied to *S. Holstii* but is distinguished by its rather large thin leaves with ascending nerves.

It is presumably this plant which Engler recorded from Shiré as *S. caulescens* (Pflanzenwelt Ost-Afrikas, C, 363 : 1895), for that species does not reach further south than the Uluguru Mountains.

S. caulescens *Vatke* in Linnaea, **43,** 323 (1882); Clarke in DC. Mon. Phan **5,** pt. 1, 154 (1888); Engl. Pflanzenwelt Ost-Afrikas, C, 363 (1895); Hook. f. in Bot. Mag. t. 6814 (1885); Baker et

Clarke in Dyer, Fl. Trop. Afr. **4,** sect. 2, 507 (1906). *S. rivularis* Engl. in Engl. Bot. Jahrb. **18,** 78 (1894) ; Pflanzenwelt Ost-Afrikas, C, 363 (1895) ; Baker et Clarke, l.c. 508 (1906). *S. caulescens* var. *pallescens* Engl. in Engl. Bot. Jahrb. **19,** 154 (1894). *S. caulescens* forma *pallescens* Engl. Pflanzenwelt Ost-Afrikas, C, 363 (1895). *S. pallidiflorus* C. B. Clarke in Dyer, Fl. Trop. Afr. **4,** sect. 2, 508 (1906).

Kenya Colony : Teita Hills.

Tanganyika Territory : Paré, Usambara and Uluguru Mountains.

S. caulescens is evidently variable in flower colour, but at present only the purple-blue coloured form is in cultivation. The herbarium specimens indicate that the pale form is not a single well-marked type and it is therefore preferable to drop the use of a varietal name for it until more is known of the range and importance of colour-variation in the whole species.

S. caulescens var. *ovatus* C. B. Clarke, which was afterwards raised to specific rank by the same author, is indistinguishable from *S. Holstii* Engl. (see below).

S. glandulosissimus *Engl.* in Engl. Bot. Jahrb. **18,** 78 (1894), Pflanzenwelt Ost-Afrikas, C, 363 (1895) ; Baker and Clarke in Dyer, Fl. Trop. Afr. **4,** sect. 2, 509 (1906). *S. Volkensii* Engl. in Engl. Bot. Jahrb. **19,** 153 (1894), et in Pflanzenwelt Ost-Afrikas, C, 363 (1895) ; Baker and Clarke, l.c. 510 (1906). *S. ruwenzoriensis* Baker, l.c. 510 (1906). *S. Smithii* C. B. Clarke, l.c. 511 (1906). *S. Mildbraedii* Engl. in Engl. Bot. Jahrb. **57,** 215 (1921). *S. Bequaertii* De Wild. in Rev. Zool. Afr. **8,** Suppl. Bot. 38 (1920).

Central and East Tropical Africa. Kivu and Ruwenzori, Aberdare Mts. and Mt. Kenya, Kilimanjaro, Ufiume Mt. and Uluguru Mts.

S. glandulosissimus Engl. is the most widely distributed of the caulescent species and, with the exception of *S. Rexii*, of the whole genus. Its range serves to emphasize a feature in the distribution of the genus as a whole. This is that no *Streptocarpus* has yet been found on Mt. Elgon, though *S. glandulosissimus* is known from Ruwenzori, the Aberdares, Mt. Kenya and Kilimanjaro, and other species, both caulescent and acaulescent, are known from the Aberdares, Mt. Kenya and Kilimanjaro. *Streptocarpus* is, however, essentially a south tropical genus and if it did occur on Mt. Elgon that would actually be its northernmost point in Africa.

Four of the " species " now united under *S. glandulosissimus* were known to Baker and Clarke when they prepared their account of the genus for the Flora of Tropical Africa, these were *S. glandulosissimus*, *S. Volkensii*, *S. ruwenzoriensis* and *S. Smithii* and all were retained as distinct species. *S. glandulosissimus* was widely separated from the other species in the key by being placed amongst those with glabrous ovary. This, however, was an error. The indumentum of the ovary is not mentioned by Engler in his

description (only the style is said to be glabrous) and dissection of a flower bud from Holst 2742 (one of the numbers quoted by Engler) shows that the young ovary is shortly but densely pubescent.

The characters used to discriminate between the other three species were taken from the shape of the calyx-lobes, and the relevant part of the key was :—

Calyx lobes oblong, subacute, gland-tipped.....17. *S. Volkensii*
Calyx lobes having a linear-tip ended by a gland.....
18. *S. ruwenzoriensis*
Calyx lobes ovate ; tip triangular without a gland...19. *S. Smithii*

From this alone it will be realized that the three " species " are very closely allied, and they are certainly indistinguishable by a merely superficial examination. Moreover, a close examination of the calyx-lobes has failed to show characters falling into the three categories indicated in the key.

The type sheet of *S. Smithii* bears three specimens which have been marked A, B and C by Clarke. A and B are flowering specimens and are the type of *S. Smithii*, C is a fruiting specimen referred by Clarke to *S. ruwenzoriensis*. Clarke has sketched an ovate-elliptic calyx-lobe from one of the flowering specimens, but I can find nothing like it ; they are 2 mm. long and about 1 mm. broad and broadest very near to the base, not near the middle as Clarke shows. On specimen C the calyx-lobes are 3 mm. long, but I can find no difference in the leaves of A, B and C and I have no doubt that they all represent one species. This is confirmed by finding that the calyx-lobes tend to be slightly longer in the fruiting than in the flowering condition and the larger size of the calyx lobes in C is in this respect perfectly normal.

With regard to the presence of a gland at the tip of calyx lobes I find that this is usually present though it may be more or less suppressed. The exact shape of the tip naturally varies somewhat, but I can find no differences that can be judged in any way significant.

The type of *S. Mildbraedii* has been sent on loan to Kew from Berlin and I am quite unable to distinguish it from *S. glandulosissimus*. I have not seen the type of *S. Bequaertii*, but I have compared a specimen named at Brussels (Lebrun 151 from Kivu) and De Wildeman's description with *S. glandulosissimus* and can find no distinguishing characteristics.

Mansfeld's *S. glandulosissimus* var. *longiflorus* cannot be retained as a variety of this species and I have raised it to specific rank under the name *S. bambuseti* (p. 80).

S. Holstii *Engl.* in Engl. Bot. Jahrb. **18,** 77 (1894) ; Baker et Clarke in Dyer, Fl. Trop. Afr. **4**, sect. 2, 508 (1906). *S. caulescens* var. *ovatus* C. B. Clarke in DC. Mon. Phan. **5,** pt. 1, 154 (1888). *S. ovatus* C. B. Clarke in Dyer, Fl. Trop. Afr. **4,** sect. 2, 508 (1906).

Tanganyika Territory. Usambara, Derema, *Holst* 2233. Amani district, 750 m., *Greenway* 754. Amani, 1050–1200 m., *B. D. Burtt* 4862. Magila, S. lat. 5° 8′, *Kirk*.

Kirk's specimen, which is the type of *S. ovatus* Clarke is clearly conspecific with the Kew specimen of Holst 2233 and it is remarkable that Clarke should have retained *ovatus* and *Holstii* as distinct species. *S. Holstii* is easily distinguished from *S. caulescens* by its thin, subsetose indumentum and larger flowers.

S. Kirkii *Hook. f.* in Bot. Mag. t. 6782 (1884); Baker and Clarke in Dyer, Fl. Trop. Afr. **4,** sect. 2, 509 (1906).

Tanganyika Territory. "From the hilly country of the coast opposite Zanzibar," *Kirk*, cultivated at Kew. Amani, 900 m.; herb growing as an epiphyte in association with Bird's Nest fern on forest tree on edge of forest and exposed to full sunlight; fls. pale blue; 2 July 1928, *Greenway* 750. Handeni district, Mgera subdistrict, on Nyogi mountain, 1050–1200 m.; on mossy branches of trees of rain forest clothing mountain summit; succulent herb with lilac-coloured–pale blue flowers, small petals; probably commoner than one is inclined to imagine as growing in inconspicuous places; 16 Sept. 1933, *B. D. Burtt* 4869.

Zanzibar is the locality given for this species in the Flora of Tropical Africa, but Hooker had already pointed out that it probably came from the mainland opposite, and this is confirmed by its rediscovery by Greenway and B. D. Burtt.

S. lilacinus *Engl.*—see *S. Buchanani.*

S. Mildbraedii *Engl.*—see *S. glandulosissimus.*

S. ovatus *C. B. Clarke*—see *S. Holstii.*

S. pallidiflorus *C. B. Clarke*—see *S. caulescens.*

S. rivularis *Engl.*—see *S. caulescens.*

S. ruwenzoriensis *Baker*—see *S. glandulosissimus.*

S. Smithii *C. B. Clarke*—see *S. glandulosissimus.*

S. Volkensii *Engl.*—see *S. glandulosissimus.*

Species excludenda.

"**S. curvipes** *Rydberg* in Bull. Torr. Bot. Club, 1901, 267—North America" sec. Index Kewensis, Suppl. **3,** 172—sphalm. *Streptopus curvipes* Rydberg.

IX—CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA: XL.*

Plantae Hintonianae: X.†

The Genus Quercus. E. F. Warburg.

The following is an enumeration of the oaks collected by Mr. G. B. Hinton in the years 1932–1937 in Mexico. It is complete with the

* Continued from K.B. 1939, 26.

† Continued from K.B. 1939, 2.

exception of a few numbers which consist of plants in flower which could not be accurately matched with existing specimens.

The collections are particularly valuable in that most of the species are represented by a good range of specimens illustrating the variation within the species which is characteristic of so many members of the genus.

For several previously known species these collections extend the range into another of the regions into which Trelease (" The American Oaks," Mem. Nat. Acad. Sc. Washington, **20,** 1924) divides North America. I consider that certain species are much more widespread than Trelease believes and that species described from different regions should in some instances be reduced to synonymy.

Many species of oak described from Mexico have been based on very inadequate material. Some of these are probably based on sucker shoots of other described species, others may be true species, but until proper material is forthcoming from their type localities it is impossible to identify new collections with them and I have had to ignore them.

Quercus baldoquinae *Trel.* in Mem. Nat. Acad. Sc. Washington, **20,** 53 (1924).

STATE OF MEXICO. District of Temascaltepec: Luvianos, " small oak, leaves grey-green, trunk black," Aug. 1933, *Hinton* 4503; June 1934, *Hinton* 6195; July 1934, *Hinton* 6363; Chorrera (vernacular name " Encino prieto "), June 1934, *Hinton* 6200; Pantoja (vernacular name "Encino prieto") Aug. 1934, Hinton 6385; Tejupilco, Sept. 1934, *Hinton* 6561.

STATE OF GUERRERO. District of Mina: Placeres-Puerta, 800 m., July 1936, *Hinton* 9051; Parotas (vernacular name " Tocuz "), grows to 1250 m., Aug. 1936, *Hinton* 9198.

Quercus centralis *Trel. l.c.* 61.

STATE OF MEXICO. District of Temascaltepec: Tejupilco, June 1932, *Hinton* 732; July 1934, *Hinton* 6331, 6332; Sept. 1934, *Hinton* 6564, 6565; San Lucas, June 1934, *Hinton* 6218.

STATE OF GUERRERO. District of Mina: Zihuaqueo–Filo Mayor, 1680 m., Aug. 1936, *Hinton* 9297; Zihuaqueo–Ojo de Agua, 1500 m., Aug. 1936, *Hinton* 9312, 9314, 9315.

Quercus platyphylla *E. F. Warburg,* sp. nov. Affinis *Q. macrophyllae* Née, a qua indumento foliorum breviore, costa basi et petiolo subtus glabro differt.

Arbor 6 m. alta. *Ramuli* 3–4 mm. diametro, glabri, leviter sulcati, brunnei, lenticellis parvis albidis instructi, sub anthesin aphylli. *Gemmae* dilute brunneae, obtusae, pubescentes, c. 2 mm. longae, terminales stipulis subulatis instructae. *Folia* obovata, 14–26 cm. longa, 8–17 cm. lata, apice obtusa, basi auriculata, marginibus crenatis, supra glabra, subtus lutescenti-stellato-tomentella, costa et nervis primariis glabris fuscis exceptis; nervi

primarii utrinque 10–15, in sinus desinentes, supra impressi, subtus prominentes; nervi secundarii plus minusve paralleli, supra impressi, subtus prominentes; nervi reticuli supra inconspicui, subtus prominentes; petioli c. 5 mm. longi, glabri. *Amenta mascula* usque 8 cm. longa, rhachi stellato-pubescente, floribus satis laxis, sepalis anguste ellipticis obtusis marginibus et nervo pubescentibus, filamentis glabris, antheris ovoideis quam filamentis paulo brevioribus. *Flores feminei* 2 vel 3 in pedunculo breviore, sepalis triangularibus pubescentibus, stylo brevissimo, ovario pubescente. *Fructus* 1–2, sessiles vel subsessiles; cupulae hemisphaericae, satis crassae, c. 2 cm. diametro, 1 cm. altae, intra tomentosae, cicatrice 1 cm. diametro, squamis ovatis acuminatis basi incrassatis dilute brunneis c. 4 mm. longis; glandes ovoideae, 2·5–3 cm. altae, brunneae, apice excepta glabrae, siccitatae sulcatae.

State of Mexico. District of Temascaltepec: Nanchititla, July 1934, *Hinton* 6360 (type); May 1934, *Hinton* 6058; June 1934, *Hinton* 6172; Rincón, May 1932, *Hinton* 642, 643; July 1934, *Hinton* 6259 (vernacular name "Jiote," same tree as 642); Las Mesas, March 1933, *Hinton* 3504 (from which flowers are described); June 1934, *Hinton* 6204; July 1934, *Hinton* 6242; La Labor, June 1933, *Hinton* 4038; Cerro los Berros, April 1934 (vernacular name "Encino Prieto") *Hinton* 5778; Tejupilco, May 1934, *Hinton* 6064; March 1935, *Hinton* 7443; Cucha, June 1934, *Hinton* 6071; July 1934, *Hinton* 6247 (same tree).

This species seems to differ constantly from the rather more northern *Q. macrophylla* Née (which is not represented in the collection) by the characters given above, but it varies considerably. In the type the leaves and fruit are large and the acorns sessile. The most extreme divergence from this is found in 6204 and 6242 with much smaller acute leaves and small pedunculate acorns. Numbers 6058, 6071 and 6247 show the same features in a less marked degree. Some or all of these may be hybrids with *Q. magnoliifolia* Née.

Quercus magnoliifolia *Née* in Anal. Cienc. Nat. **3**, 268 (1801).—*Q. lutea* Née *l.c.*—*Q. circinata* Née *l.c.* 272.

State of Mexico. District of Temascaltepec: Tule, June 1934, *Hinton* 6088, 6252; Nanchititla, June 1934, *Hinton* 6165; Chorrera, June 1934, *Hinton* 6198; Pantoja, June 1934, *Hinton* 6220, Aug. 1934, *Hinton* 6386 (same tree); Tejupilco, June 1934, *Hinton* 6235; July 1934, *Hinton* 6329; Ocotopec, Aug. 1934, *Hinton* 6388, 6390, 6391.

State of Guerrero. District of Mina: Filo Aguazarca (top) 1760 m. (vernacular name "Encino Amarillo"), Aug. 1936, *Hinton* 9235; Manchon, 1200 m. (vernacular name "Encino Amarillo"), Aug. 1936, *Hinton* 9241; Zihuaqueo–Ojo de Agua, 1500 m., Aug. 1936, *Hinton* 9313.

This species is very well represented in Hinton's collections and like the preceding shows considerable variation in size of acorn, the

extremes being *Hinton* 6386 with very small cups and acorns, and *Hinton* 6390 with large cups with the upper scales narrow, thus resembling those of *Q. platyphylla*.

Through the courtesy of the University of Madrid I have had the opportunity of examining the types of *Q. magnoliifolia* Née and *Q. lutea* Née. *Q. lutea* differs from *Q. magnoliifolia* only in the leaves being slightly cordate at the base and is not separable as a distinct species. *Q. circinata*, of which the type was unfortunately not available, seems to be the same species with the leaves rather more deeply toothed ; some of Mr. Hinton's specimens are of this form. *Q. Liebmannii* Oerst. ex Trel. is probably the same species, but as it comes from further south I hesitate to reduce it until further material is available.

Quercus haematophlebia *Trel. l.c.* 66.

State of Mexico. District of Temascaltepec : Chorrera, July 1934, *Hinton* 6326.

I am extremely doubtful if this species is distinct from the last.

Quercus peduncularis *Née* in Anal. Cienc. Nat. **3,** 270 (1801) ; Trel. *l.c.* 69.

State of Mexico. District of Temascaltepec : Cumbre de Tejupilco, Sept. 1934, *Hinton* 6555 ; Sept. 1935, *Hinton* 8422 (same tree).

Quercus dolichopus *E. F. Warburg*, sp. nov. A *Q. pedunculari* Née et speciebus affinibus tomento multo minus laxo in ramulis pedunculisque diutius persistente, a *Q. magnoliifolia* Née tomento longiore, squamis cupularum longioribus et angustioribus differt.

Frutex vel *arbor*, 3 m. alta. *Ramuli* hornotini tomentosi, haud sulcati, circiter 3 mm. diametro ; annotini cinerei, lenticellis parvis cortice paulo pallidioribus instructi. *Gemmae* ovoideae, c. 2 mm. longae, tomentosae. *Folia* obovato-elliptica, 9–13 cm. longa, 3·5–6 cm. lata, apice obtusiuscula, basi rotundata, marginibus supra medium leviter repando-dentata, dentibus breviter mucronatis, supra glabra costa et nervis primariis exceptis, satis nitida, subtus dense et aliquanto lanuginose tomentosa, tomento dilute brunneo ; nervi primarii utrinque 8–14, in dentes desinentes, subtus prominentes ; petioli 0·5–1 cm. longi, dense tomentosi. *Fructus* 1–4 in pedunculo tomentoso 7–10 cm. longo ; cupulae poculiformes, 1·4–1·8 cm. diametro, c. 1 cm. altae, intus tomentosae, cicatrice 0·8–1·0 cm. diametro, squamis ovatis acuminatis tomentosis dilute brunneis appressis haud incrassatis c. 3 mm. longis.

State of Mexico. District of Temascaltepec : San Lucas, March 1934, *Hinton* 6378.

This species, though represented only by a single gathering, is distinct in its tomentum from previously described species.

Quercus rhodophlebia *Trel. l.c.* 74.

State of Mexico. District of Temascaltepec : Socabon, June 1932, *Hinton* 829 ; Oct. 1934, *Hinton* 6806, 6807 ; Dec. 1934, *Hinton*

7108; Comunidad-Cieneguillas (vernacular name "Encino"), June 1934, *Hinton* 6085.

Quercus atriglans *E. F. Warburg*, sp. nov. Affinis *Q. innuncupatae* Trel., sed ramulis fuscioribus, lenticellis valde prominentibus, glandibus longioribus differt.

Arbor 10 m. alta. *Ramuli* c. 3 mm. diametro, glabri vel paulum pubescentes, leviter sulcati, brunnei, lenticellis albidis prominentibus instructi, demum cinerei. *Gemmae* ovoideae, obtusae, squamis ciliatis exceptis glabrae, 2–3 mm. longae. *Folia juvenilia* purpurea, supra parce rufo-pubescentia, subtus nervis stellato-pubescentia. *Folia adulta* obovato-elliptica, 8–16 cm. longa, 3·5–8 cm. lata, apice obtusa vel obtusiuscula, basi cordata vel auriculata, marginibus supra medium repando-dentata, dentibus saepe mucronatis, supra (costa basi excepta) glabra glaucescentia, subtus praecipue in nervis sparse lutescenti-stellato-pubescentia; nervi primarii utrinque 8–14, supra leviter impressi, subtus valde prominentes, in dentes desinentes; nervi reticuli supra aliquanto impressi, subtus prominentes; petioli 0·7–1·2 cm. longi, pubescentes. *Amenta mascula* usque ad 7 cm. longa, rhachi pubescente; flores basin versus satis sparsi, supra densiores, sepalis extus pubescentibus triangulari-ovatis, staminibus c. 8, filamentis sepalis subaequilongis glabris. *Flores feminei* in pedunculo c. 2 cm. longo suffulti, sepalis triangulari-ovatis pubescentibus, stylo breviore, stigmatibus capitatis, ovario pubescente. *Fructus* anno primo maturascentes, 1–3 in extremitate pedunculi 3–6 cm. longi 3 mm. lati; cupulae poculiformes, 1·5–2 cm. diametro, c. 1 cm. altae, intus tomentosae, cicatrice 1 cm. diametro vel minore, squamis appressis ovatis acutis c. 3 mm. longis basi incrassatis; glandes globoso-cylindricae, 1·5–2 cm. altae, apice depressae, olivaceo-fuscae, c. $\frac{1}{3}$ inclusae.

State of Mexico. District of Temascaltepec: Ypericones, Sept. 1934, *Hinton* 6549 (typus); Oct. 1934, *Hinton* 6773; Nov. 1934, *Hinton* 6993, 6994; Cajones, March 1933, *Hinton* 3475 (from which the young leaves and female flowers are described), 3481 (vernacular name "Encino Roble"); Jan. 1935, *Hinton* 7194, 7198; Pantoja March 1933, *Hinton* 3548; La Labor, Oct. 1934, *Hinton* 6592; Comunidad, Sept. 1934, *Hinton* 6585; Cuentla, Oct. 1934, *Hinton* 6805 ("ripe acorn black").

State of Guerrero. District of Mina: Filo–Aguazarca, Aug. 1936, *Hinton* 9217 (at 1400 m.), 9233 (at 1600 m.); Manchon, 1280 m., Aug. 1936, *Hinton* 9227; 1340 m. Oct. 1936, *Hinton* 9647; Aguazarca–Filo, Sept. 1936, *Hinton* 9572; Zihuaqueo–Ojo de Agua, 1500 m., Aug. 1936, *Hinton* 9317; Zihuaqueo–Filo Mayor, 1680 m., Aug. 1936, *Hinton* 9299.

This species differs from most of the series *Reticulatae* in being much less pubescent and in its narrower leaves. It may not be distinct from *Q. innuncupata* Trel., but that species is based on inadequate material and until more material from the type locality is available it seems best to keep this distinct as it is so well

represented in Hinton's collections. A notable feature of the present species is the colour of the acorn, dark olive brown when dry and, according to Mr. Hinton, black when fresh, at least in his number 6805. The leaves vary from merely sinuate to dentate on different trees. In particular *Hinton* 7198 has dentate leaves, narrower than usual, less thickened cup scales and a paler acorn (but this may not be ripe); it may be distinct. *Hinton* 6585 is similar in leaf but lacks fruit.

Quercus scytophylla *Liebm.* in Overs. Dansk. Vidensk. Selsk. Forhandl. 1854, 180; Trel. *l.c.* 125.

STATE OF MEXICO. District of Temascaltepec: La Labor, Feb. 1933 (vernacular name "Encino Blanco"), *Hinton* 3242, 3244; Las Mesas, June 1934, *Hinton* 6089, 6203 (same tree); *Socabon*, 2320 m., June 1934, *Hinton* 6091; July 1934, *Hinton* 6246; Nanchitla, June 1934, *Hinton* 6136, 6156; July 1934, *Hinton* 6348; Feb. 1935, *Hinton* 7379; Comunidad–Cieneguillas, 2250 m., July 1934, *Hinton* 6239.

STATE OF GUERRERO. District of Mina: Tihaqueo–Filo Mayor, 1700 m., Aug. 1936, *Hinton* 9291.

Previously only recorded from Oaxaco. Apparently not a very variable species. Judging by Trelease's figure, it appears to me likely that *Q. campanariensis* Trel. (*l.c.* 126) is based on a sucker shoot of this species.

Quercus crassifolia *Humb. et Bonpl.* Pl. Aequinoct. **2,** 49 (1809); Trel. *l.c.* 128; *Q. stipularis* Humb. et Bonpl. *l.c.* 47; Trel. *l.c.* 130.

STATE OF MEXICO. District of Temascaltepec: Las Cruces, 2650 m., Feb. 1933, *Hinton* 3283; Meson Viejo, 2800 m., Feb. 1933, *Hinton* 3288; Cumbre, May 1934, *Hinton* 5920; Jan. 1935, *Hinton* 7196; Comunidad–Cieneguillas, 2200 m., May 1934, *Hinton* 5935; Sept. 1934, *Hinton* 6572, 6573; Comunidad, July 1934, *Hinton* 6243; Aug. 1934, *Hinton* 6402, 6403; San Miguel, Aug. 1934, *Hinton* 6401; Sept. 1934, *Hinton* 6586.

STATE OF GUERRERO. District of Mina: Fresnos, 2140 m., Oct. 1936, *Hinton* 9743.

This species, which appears to be widespread and rather common in central Mexico, is variable in the shape and size of its leaves. Hinton's specimens connect the large-leaved *Q. crassifolia* with the smaller-leaved and much more deeply toothed *Q. stipularis*. I retain for the combined species the better-known name used by Liebmann and de Candolle.

The differences between this species and *Q. fulva* Liebm. are misunderstood by Trelease. *Ross* 376, which is figured by Trelease and from which he describes the acorns, is certainly not *Q. fulva* and, judging by Trelease's figure, is *Q. crassifolia*. The fact that it comes from Michoacan would support this assumption.

Pringle 1361, *Palmer* 76 (both of these referred to *Q. fulva*) and *Hartman* 713 [referred to *Q. pennivenia* Trel. (*l.c.* 135)] from

Chihuahua and Durango, of all of which I have seen specimens, are either *Q. crassifolia* or more probably a distinct new species, but I have not seen fruit.

Quercus fulva differs in its much thinner rich yellow tomentum and long pointed buds. The only specimen I have seen, apart from Seeman's original gathering, is *Ortega* 973, unfortunately, like the type, unlocalised, but from Sinaloa or Tepic. It is without fruit.

Quercus moreliana Trel. (*l.c.* 130) is probably based on a sucker shoot of *Q. crassifolia*, but I have not seen a specimen.

Quercus crassifolia var. **errans** (*Trel.*) *E. F. Warburg*, stat. nov.—*Q. errans* Trel. *l.c.* 131.

State of Mexico. District of Temascaltepec: Comunidad–Cieneguillas, June 1934, *Hinton* 6083; Sept. 1934, *Hinton* 6574.

Differs from the type in its biennial fruit.

Quercus Hahnii *Trel. l.c.* 131.

State of Mexico. District of Temascaltepec: Comunidad–Cieneguillas, 2250 m., July 1934, *Hinton* 6240: Oct. 1934, *Hinton* 6800.

Quercus sagata *E. F. Warburg*, sp. nov. Affinis *Q. Hahnii* Trel., a qua differt glande apice plana, foliis acutis.

Arbor 10 m. alta. *Ramuli* hornotini stellato-tomentosi, leviter sulcati, 2–3 mm. diametro, annotini cinereo-brunnei, lenticellis inconspicuis. *Gemmae* ovoideae, rufo-brunneae, glabrescentes, usque ad 5 mm. longae. *Folia* ovato-lanceolata, 8–10·5 cm. longa, 2–3·5 cm. lata, apice acuta mucronata, basi rotundata vel cordata, marginibus integra revoluta paulum undulata, supra glabra, costa basi excepta, siccitate nitida (statu vivo haud nitida sec. *Hinton*) subtus dense lanuginoso-stellato-tomentosa, tomento dilute lutescenti-brunneo; nervi utrinque 10–13, marginem versus curvati et in venulas plurimas divisi, e costa angulis diversis exeuntes, supra impressi, subtus prominentes; petioli c. 1 cm. longi, 2 mm. lati, stellato-tomentosi. *Fructus* anno secundo maturescentes, saepissime solitarii, subsessiles; cupulae poculiformes, c. 1·5 cm. diametro, intus sericeo-pubescentes, cicatrice c. 7 mm. diametro, squamis appressis obtusis puberulis dilute brunneis apice fuscioribus; glandes globoso-cylindricae, c. 1·3 cm. diametro, apice planae umbonatae, dilute brunneae, detersile furfuraceo-pubescentes, cicatrice plana vel paulum concava.

State of Mexico. District of Temascaltepec: Cuentla, Sept. 1934, *Hinton* 6577, "leaves very dark green, not shiny."

This differs from other species of this section in its flat-topped acorn. The leaves resemble in shape those of *Q. dysophylla* Benth. but are never toothed. I at first thought this species might be referred to *Q. Fournieri* Trel. but that species has a more floccose detersible tomentum and much smaller fruits.

Quercus esperanzae *Trel. l.c.* 132.

State of Mexico. District of Temascaltepec: Meson Viejo, Sept. 1934, *Hinton* 6587, "leaves shiny."

This has larger leaves, and veins less impressed than in the type. It may prove to be a distinct species.

Quercus Urbani *Trel. l.c.* 133.

STATE OF MEXICO. District of Sultepec : Almoloya, Jan. 1933, *Hinton* 3224 (vernacular name " Cucharillo "). District of Temascaltepec : Nanchititla, Feb. 1933, *Hinton* 3423 ; June 1934, *Hinton* 6149 (vernacular name " Cucharillo ") ; Pantoja, June 1933, *Hinton* 4079 ; Comunidad–Cieneguillas, July 1934, *Hinton* 6241.

Quercus Hintoni *E. F. Warburg*, sp. nov. Affinis *Q. Rosei* Trel. et *Q. planipoculae* Trel. ; ab illa cupula fere plana, ab hac cupula multo minore (1·5 cm. nec 2–2·5 cm. diametro) margine haud involuta, ab utraque foliis angustioribus et longioribus discedit.

Arbor 8 m. alta. *Ramuli* hornotini stellato-tomentosi, sulcati, 3–4 mm. lati, annotini minus tomentosi, purpureo-brunnei, lenticellis inconspicuis. *Gemmae* ovoideae, rufo-brunneae, acutae vel obtusae, 3–4 mm. longae, glabrae, squamis ciliatis exceptis. *Folia juvenilia* supra rubra, subtus albida, utrinque tomentosa. *Folia adulta* crasse coriacea, lanceolata vel ovato-lanceolata, 9–18 cm. longa, 3–5·5 cm. lata, apice acuta vel acuminata, aristata, basi rotundata vel cuneata, margine integra vel apicem versus parcissime aristato-serrata, supra glabra, costa et nervis furfuraceo-tomentosis exceptis, haud nitentia, subtus dense et crasse lanato-tomentosa, tomento lutescenti-brunneo ; nervi primarii utrinque circiter 10, supra impressi, subtus prominentes, marginem versus sursum curvantes et in venulas plurimas divisi, nervi reticuli supra impressi subtus prominentes ; petioli 1–2·5 cm. longi, utrinque dense stellato-tomentosi. *Amenta mascula* usque 10 cm. longa, floribus densis, rhachi tomentosa, sepalis rubris ovatis obtusis longe ciliatis, antheris rubris glabris quam filamenta glabra paulo brevioribus. *Flores feminei* stylo longiore spatulato instructi. *Fructus* anno secundo maturescentes, 1–3 in pedunculo 0·5–1·5 cm. longo ; cupulae patelliformes, c. 1·5 cm. diametro, usque ad 5 mm. altae, squamis laxe appressis triangulari-ovatis obtusiusculis cinereo-brunneis pubescentibus, intus tomentosae, cicatrice 8 mm. diametro ; glandes globoso-ovoideae, apice acutae, c. 1·5 cm. altae.

STATE OF MEXICO. District of Temascaltepec : Nanchititla, Jan. 1933, *Hinton* 3096 ; June 1934, *Hinton* 6148 ; July 1934, *Hinton* 6349, 6350, 6359 (typus) ; Los Hornos, Dec. 1932, *Hinton* 2835 ; Berros, Dec. 1934, *Hinton* 5779 (from which flowers and young leaves are described) ; June 1934, *Hinton* 6074 ; Sept. 1934, *Hinton* 6570 ; Oct. 1934, *Hinton* 6588 (same tree as 5779) ; Tenayac, April 1934, *Hinton* 6074 ; Chorrera, June 1934, *Hinton* 6199, July 1934, *Hinton* 6327 ; Pantoja, June 1934, *Hinton* 6225 ; Tule, Aug. 1934, *Hinton* 6392.

The leaves vary considerably : some specimens have broader ovate or obovate leaves than the type, on some trees they are always entire, on others always toothed, sometimes raised between the veins

on the upper surface. The peduncles may be close together on the branches or widely spaced. The shape and size of the cup is however, very constant. A remarkable form with thin tomentum beneath, but otherwise like the type, occurs at San Lucas (July 1934, *Hinton* 6376). It may possibly be a hybrid. Possibly also hybrids with *Q. conspersa* are the following. Berros, June 1934, *Hinton* 6073; Sept. 1934, *Hinton* 6569. They have leaves like *Q. conspersa* in shape but much more tomentose below. The fruits resemble those of *Q. conspersa* (see p. 93).

Quercus planipocula *Trel. l.c.* 136.

State of Guerrero. District of Montes de Oca: Vallecitos, 600 m., Nov. 1936, *Hinton* 9905.

Quercus chiquihuitillonis *Trel. l.c.* 139.

State of Mexico. District of Temascaltepec: Nanchititla, Jan. 1933, *Hinton* 3102; Dec. 1933, *Hinton* 5346; May 1934, *Hinton* 6060; Nov. 1934, *Hinton* 7068; Feb. 1935, *Hinton* 7363.

Quercus peradifolia *E. F. Warburg*, sp. nov. Affinis *Q. chiquihuitillonis* Trel. et *Q. Langlassei* Trel., a quibus fructu anno primo maturescente, foliis ovalibus latioribus discedit.

Arbor 10 m. alta. *Ramuli* hornotini dense lutescenti-tomentosi, vix sulcati, annotini glabri, cinereo-brunnei, lenticellis inconspicuis. *Gemmae* minimae (minores quam 1 mm.), conicae, glabrae. *Folia* ovalia vel obovato-ovalia, 5–7 cm. longa, 3·5–4·5 cm. lata, apice rotundata, basi cordata vel auriculata, marginibus integra paulum revoluta, supra glabra, costa basi tomentosa excepta, paulum nitida, nonnunquam aliquanto bullata, subtus haud nitida, glabra, fasciculis axillaribus exceptis; costa utrinque prominens, apicem versus bifurcata; nervi primarii utrinque 6–8, supra paulum impressi, subtus valde prominentes, marginem versus semel vel bis bifurcati et per arcus inter se conjuneti; nervi reticuli supra inconspicui, subtus aliquanto prominentes; petioli circiter 1 mm. longi, utrinque tomentosi. *Fructus* solitarii vel bini, subsessiles, anno primo maturescentes; cupulae patelliformes, c. 1·5 cm. diametro, marginibus involutae, intus sericeo-tomentosae, cicatrice c. 1 cm. diametro, squamis appressis obtusis ovato-triangularibus apice excepta tomentosis; glandes globoso-ovoideae, umbonatae, c. 1·7 cm. altae, glabrescentes, pallide brunneae, cicatrice plana, intus tomentosae.

State of Mexico. District of Temascaltepec: Nanchititla, May, 1934, *Hinton* 6062.

This may prove to be conspecific with the last, but in addition to the characters given above it differs in the shape of the fruit and the less conspicuous veins of the leaf. The species of this alliance (*Langlasseiae* and *Aristatae*) have not been much collected and the status of the various forms is not clear.

The figure of *Q. elliptica* Née given by Trelease strongly suggests this species in shape of leaf and venation and it is possible that it

may be found to belong to this group rather than to *Q. Castanea* Née as suggested by Trelease.

Quercus Bourgaei *Oerst. ex Trel. l.c.* 168, var. **ilicifolia** *Trel. l.c.*

STATE OF MEXICO. District of Temascaltepec: Socabon, June 1932, *Hinton* 828; Sept. 1934, *Hinton* 6582 (2500–3000 m.); Meson Viejo, 2830 m., Feb. 1933, *Hinton* 3263; Los Hornos, 2550 m., Feb. 1933, *Hinton* 3296; Las Cruces, 3350 m., April 1933, *Hinton* 3693; Cumbre, 2950 m., April 1934, *Hinton* 5782; Cajones, Dec. 1934, *Hinton* 7104.

Quercus crassipes *Humb. et Bonpl.* Pl. Aequinoct. **2,** 737 (1809); Trel. *l.c.* 175.

STATE OF MEXICO. District of Temascaltepec: Comunidad–Cieneguillas, June 1934, *Hinton* 6084; Hornos, June 1934, *Hinton* 6094; Sept. 1934, *Hinton* 6583 (at 2500 m.).

Quercus Rossii *Trel. l.c.* 179.

STATE OF MEXICO. District of Temascaltepec: Platanal, June 1934, *Hinton* 6210 San Lucas, June 1934, *Hinton* 6217 (vernacular name "Encino Colorado") " Oct. 1934, *Hinton* 6737 (vernacular name "Encino Chino"); Temascaltepec, Aug. 1934, *Hinton* 6398; Dec. 1934, *Hinton* 7188; La Labor, Oct, 1934, *Hinton* 6593 (vernacular name "Encino Blanco"); Cucha, Oct. 1934, *Hinton* 6804; Cajones, Jan. 1935, *Hinton* 7193.

STATE OF GUERRERO. District of Mina: Manchon, 1200–1300 m., Aug. 1936, *Hinton* 9224, 9225, 9226; Zihaqueo–Ojo de Agua, 1500 m., Aug. 1936, *Hinton* 9316; Pilas, 1600 m., Sept. 1937, *Hinton* 10736.

Quercus conspersa *Benth.* Pl. Hartweg. 92 (1842).—*Q. nitida* Mart. et Gal. in Bull. Acad. Brux. **10,** 210 (1843), non Raf. (1838); Trel. *l.c.* 191—*Q. uruapanensis* Trel. *l.c.* 143.—*Q. Candolleana* Trel. *l.c.* 191.

STATE OF MEXICO. District of Temascaltepec: Timbres, June 1934, *Hinton* 6087; Oct. 1934, *Hinton* 6591; Nanchititla, June 1934, *Hinton* 6140; Aug. 1934, *Hinton* 6516; Pantoja, June 1934, *Hinton* 6224; Aug. 1934, *Hinton* 6384 (same tree); Mina de Agua, July 1934, *Hinton* 6238; Tejupilco, July 1934, *Hinton* 6330; Ocotepec, Aug. 1934, *Hinton* 6387, 6389; Temascaltepec, Aug. 1934, *Hinton* 6399, 6400; Oct. 1934, *Hinton* 6589; Cajones, 2500 m., Aug. 1934, *Hinton* 6409.

STATE OF GUERRERO. District of Mina: Manchon, 1300 m., Aug. 1936, *Hinton* 9216; Pilas, 1600 m., Sept. 1937, *Hinton* 10729, 10737.

As I understand this species it extends from Guatemala through Oaxaca to Michoacan. It is an extremely variable species in leaf form. Three main forms of leaf occur: (1) large, entire, ovate; (2) smaller, entire, ovate-lanceolate, much tapered at the apex; (3) large, setaceously serrate. These appear always to occur on

different trees. The acorn cups vary from hemispheric to obconic. These differences in the shape of cup are not in any way correlated with the leaf differences. On the other hand the texture and tomentum of the leaf, the inrolling of the margin of the cup and the biennial fruit appear to be constant. *Q. uruapanensis* Trel. though not placed by its author near *Q. conspersa* appears to me not to differ at all from the entire-leafed form of that species.

It is possible that *Q. conspersa* will ultimately be reduced to the little known *Q. acutifolia* Née which needs collecting again in the type locality, though that species appears to differ in the much longer teeth to the leaves, and, if Humboldt and Bonpland are correct in their determination, by the rounded leaf-base.

Quercus candicans *Née* in Anal. Cienc. Nat. **3,** 277 (1801).—*Q. calophylla* Cham. et Schlecht. in Linnaea, **5,** 79 (1830).

State of Mexico. District of Temascaltepec: La Sierrita, March 1933, *Hinton* 3451; Nanchititla, June 1934, *Hinton* 6147, 6169; July 1934, *Hinton* 6358, 6361; Aug. 1934, *Hinton* 6515; Oct. 1934, *Hinton* 6761, 6763; Comunidad, Oct. 1934, *Hinton* 6801.

State of Guerrero. District of Mina: Aguazarca–Filo, Sept. 1936, *Hinton* 9569; Pilas, 1600 m., Sept. 1937, *Hinton* 10673, 10722, 10738.

I can see no difference between the eastern *Q. calophylla* and the western *Q. candicans*, assuming that Trelease is right, as I think he is, in regarding *Q. candicans* as a juvenile or sucker form of what he calls *Q. candicans* f. *michoacana* (*l.c.*). Hinton's specimens show little variation.

Quercus ochroësthes *E. F. Warburg*, sp. nov. Affinis *Q. candicanti* Née, a qua tomento densiore lutescente, nervis supra magis profunde impressis in mucrones sed non in aristas desinentibus, cupula minus profunda differt.

Arbor 7 m. alta. *Ramuli* hornotini tomentosi, leviter sulcati, 2–3 mm. diametro, annotini purpureo-brunnei, fere glabri, lenticellis inconspicuis. *Gemmae* rufo-brunneae, ovoideo-conicae, glabrescentes, usque 3 mm. longae. *Folia* obovata, 7–9 cm. longa, 3·5–4 cm. lata, apice acuminata mucronata, basi cordata, marginibus leviter sinuata, apicem versus parce aristato-serrata, supra glabra, nitida, subtus dense lutescenti-stellato-tomentosa; nervi primarii utrinque c. 10, supra impressi, subtus prominentes, in mucrones desinentes vel marginem versus in venulas plurimas divisi; nervi reticuli supra impressi, subtus prominentes; petioli 1·5–2 cm. longi, c. 2 mm. lati, parce tomentosi. *Fructus* anno secundo maturescentes, in quaque consocie 1–3, subsessiles, consociebus ad apicem incrementi anni conglomeratis; cupulae haud profundae, poculiformes, c. 1·7 mm. diametro, usque 8 mm. altae, intus sericeo-tomentosae, cicatrice c. 8 mm. diametro, squamis triangulari-ovatis obtusis puberulis laxe appressis; glandes c. $\frac{1}{3}$ inclusae, depresse globosae, apice planae vix

umbonatae, c. 1·5 cm. altae, dilute brunneae, detersile furfuraceo-tomentosae, intus dense tomentosae, cicatrice plana vel leviter concava.

State of Mexico. District of Temascaltepec: Mina de Agua, June 1934, *Hinton* 6077; Sept. 1934, *Hinton* 6576 (typus).

Quercus apiophylla *E. F. Warburg*, sp. nov. Species distincta cum *Q. candicante* Née comparanda sed forma foliorum valde distincta.

Arbor 10 m. alta. *Ramuli* hornotini lutescenti-tomentosi, leviter sulcati, 2–3 mm. diametro, annotini rufo-brunnei, fere glabri, lenticellis inconspicuis. *Gemmae* globoso-ovoideae, obtusae, 1–2 mm. longae et latae, glabrescentes. *Folia* ovata, 6·5–9·5 cm. longa, 2·5–3·8 cm. lata, apice longe acuminata, basi rotundata vel subcordata saepe inaequalia, marginibus integra, supra glabra paulum nitida, subtus dense lutescenti-stellato-tomentosa, nervis exceptis; nervi primarii utrinque c. 8, saepe cum minoribus interpositis et prope apicem, marginem versus in venulas plurimas divisi, supra impressi, subtus prominentes, nervi reticuli utrinque paulum elevati sed vix conspicui; petioli 0·7–1·5 cm. longi, c. 1 mm. lati, supra plani, furfuraceo-pubescentes, subtus teretes. *Fructus* anno secundo maturescentes, in pedunculo brevi (minore quam 1 cm.) solitarii vel bini; cupulae poculiformes, c. 1·5 cm. diametro, squamis appressis triangulari-ovatis puberulis cinereo-brunneis apice fusciori-bus; glandes globoso-ovoideae, apice rotundatae sed umbonatae, c. 1·5 cm. altae, dilute brunneae, tenuiter et detersile furfuraceo-pubescentes, intus tomentosae, cicatrice plana.

State of Mexico. District of Temascaltepec: Berros, June 1934 (vernacular name "Encino"), *Hinton* 6072; Sept. 1934, *Hinton* 6568 (typus); Mina de Agua, July 1934, *Hinton* 6237.

A very distinct species, not to be placed in any of Trelease's series.

X—CONTRIBUTIONS TO THE FLORA OF BURMA: XV.*

The regions in brackets after each species are those from which it has been reported previously.

Rhododendron araiophyllum *Balf. f. et W. W. Smith* [Ericaceae]. (Yunnan).

Myitkyina District: near Hpimaw Fort, 2450 m., fls. April. *C. W. D. Kermode* 17046, "6–10 ft. tall, fls. 1½ in. long, white with scarlet blotch in throat"; in evergreen forest on ridge North East of Hpimaw running to the Frontier at Hpawseik Bum, 2770–3100 m., *Kermode* 17054, 17056, "20–30 ft. tall, fls. white spotted with crimson"; evergreen forest on Langyaw, 2175 m., fls. March, *Kermode* 17115, "15–25 ft. tall."

Rhododendron bullatum *Franch.* [Ericaceae]. (W. China).

---

* Continued from K.B. 1938, 296.

Myitkyina District : above Hpimaw, 1850–2100 m., fls. April. *Kermode* 17032, " fls. 3 in. across, white with patch of yellow within, strongly scented ; on ridge North East of Hpimaw running up to the frontier at Hpawseik Bum, 2460–2700 m., *Maung Po Khant* 17059, " 5 ft. tall, fls. white " ; Fengshuiling Pass, 2600 m., *Kermode* 17222, epiphytic shrub 6–8 ft. tall, fls. unscented, calyx tinged pink, corolla white, pink outside."

Rhododendron campanulatum *D. Don* [Ericaceae].

(Kashmir to Bhutan).

Myitkyina District : on way to Chimili Pass, 3700 m., fls. May, *Kermode* 17278, " 10–15 ft. tall ; fls. 2 in. across, white flushed with pink with a small blob of scarlet in throat."

Rhododendron decorum *Franch.* [Ericaceae].

(W. China).

Myitkyina District : over 1 mile above Hpimaw Fort, 2460–2700 m., fls. April, *Kermode* 17237, " 10–15 ft. tall, young leaves appearing before fls., fls. 2 in. across, white, anthers yellow-white."

Rhododendron eclecteum *Balf. f. et Forr.* [Ericaceae].

(S.E. Tibet and Yunnan).

Myitkyina District : in snow on ridge North East of Hpimaw, 3400-3700 m., fls. April, *Maung Po Khant* 17037, " 10 ft. tall, leaves veined yellow, pale-yellow below ; fls. almost a deep salmon-pink, lighter inside and spotted with brown."

Rhododendron Genestierianum *Forr.* [Ericaceae].

(Yunnan).

Myitkyina District : above Zuklang, 2770 m., fls. April, *Kermode* 17156, " one plant seen, in dense shade, 4–5 ft. tall, fls. plum-purple ; buds and petals covered with plum-like bloom."

Rhododendron hypolepidotum *Balf. f. et Forr.* [Ericaceae].

(S.E. Tibet).

Myitkyina District : above Hpimaw, 2460-2770 m., fls. April, *Kermode* 17033, " 3–4 ft. tall, fls. 1 in. across, deep-yellow, anthers brown."

Rhododendron leptothrium *Balf. f.* [Ericaceae].

(Yunnan).

Myitkyina District : near Hpare Village, 1860 m., fls. May, *Kermode* 17184, 17188, " 15 ft. tall, fls. 1–1½ in. across, pale-mauve with a splash of deep-mauve in throat, or deep mauve-pink with a splash of deep-mauve in throat."

Rhododendron Lindleyi *T. Moore* [Ericaceae].

(Sikkim, Bhutan and Manipur).

Myitkyina District : Laikam-Humyetaung road, fls. April, *Kermode* 17100, " on fallen tree-trunk, 5–6 ft. tall, leaves yellow-green, dotted with red glands below ; petioles glandular ; fls. pure

waxy-white with a splash of gold in the throat on posterior petal, scented, anthers brown."

Rhododendron obtusum *Planch.* [Ericaceae].
(Japan).
Myitkyina District: near Hpare Village, 1860 m., fls. April, *Kermode* 17191, 3–6 ft. tall, branchlets reddish, fls. 1 in. long, white or pale-pink, spotted with scarlet."

Rhododendron rubiginosum *Franch.* [Ericaceae].
(Yunnan).
Myitkyina District: on way to Chimili Pass, c. 3700 m., fls. May, *Kermode* 17279, " 10–15 ft. tall, branchlets silvery, underside of leaves purplish-brown; fls. 1½ in. across, pale-pink, two posterior petals spotted scarlet."

Rhododendron Simsii *Planch.* [Ericaceae].
(Throughout China and Formosa).
Myitkyina District: on rocks beside the Tumpang-Hka tributary about 1 mile from Saniku, 300 ft., fls. March, *Kermode* 16602, " 4–5 ft. tall, fls. salmon-pink with carmine blotches on posterior petals; banks of Ngawchang Hka on way to Tangtung from Hpimaw, 1550 m., fls. end April, *Kermode* 17245, " 8–10 ft. tall, fls. salmon-pink"; banks of Ngawchang Hka on Tangtung-Kangfand road, 1860–2200 m., fls. end April, *Kermode* 17245, " 10–15 ft. tall, fls. 1½ in. across, deep-pink spotted scarlet."

Rhododendron suberosum *Balf. f. et Forr.* [Ericaceae].
(Yunnan).
Myitkyina District: near Chanyinku, 2200 m., fls. 1st April, *Kermode* 17143, " 10 ft. tall, fls. pale-mauve."

Rhododendron taronense *Hutch.* [Ericaceae].
(Yunnan).
Myitkyina District: on rocks beside stream near Hpare rest-house, 1860 m., fls. early April, *Kermode* 17170, " 5–6 ft. tall, fls. 3 in. across, white, posterior petal tinged gold, anthers black."

Androsace Henryi *Oliv.* [Primulaceae].
(China).
Myitkyina District: Lagwi Pass on damp bank, 2460 m., fls. April, *Kermode* 17002; above Pawte, 2460–2770 m., fls. May, *Kermode* 17261, " 6–8 in. tall; fls. ¼ in. across, white with yellow ' eye '."

Primula euosma *Craib* [Primulaceae].
(Yunnan).
Myitkyina District: near snow 3100–3400 m., fls. May, *Kermode* 17295, " 3 in. tall; veins of leaves reddish; fls. mauve-blue with pale-yellow ' eye '."

var. **puralba** *W. W. Smith.*

Myitkyina District: above Hpawte on way to Chinili on rocks and wet ground, 2460–2770 m., fls. practically over in May, *Kermode* 17265, "4–6 in. tall; some leaves petiolate, others with blade down to root-level; fls. white with faint yellow 'eye'."

Primula sonchifolia *Franch.* [Primulaceae].

(China).

Myitkyina District: Hpimaw Pass, 3100–3400 m., fls. April, *Kermode* 17037 "8 in. tall, plant covered with farina; fls. blue with yellow 'eye'."

Breynia subterblanca *C.E.C.Fischer*, comb. nov. [Euphorbiaceae].

This species was published as *Glochidion subterblancum* in K.B. 1927, 211, the fruits being unknown. I am obliged to Dr. Léon Croizat for pointing out to me that it is more akin to *Breynia*, especially in its vegetative characters. I agree and therefore propose the above new combination. It is very near *Breynia glauca* Craib, but differs in the broader ovate leaves which are usually blunt and not mucronate, creamy-white below with the nerves very indistinct below.

XI—NOTES ON CAREX: V.* E. Nelmes.

Two Near Relatives of *C. sylvatica* Huds.

Carex sylvatica Huds. is a common European sedge which spreads thinly into western Asia and possibly into north Africa.

All the nine species, except one, associated with it by Kükenthal in the Pflanzenreich, occur at considerable distances from the area occupied by *C. sylvatica* itself. Two are Himalayan, two Chinese, three North American, and the eighth occurs in north and east Asia. The exceptional ninth, *C. latifrons* Krecz. (*C. latifolia* Boiss. et Bal.), is a plant of the Caucasus, and is the only close ally of *C. sylvatica* hitherto described. These ten species together form Subsection 6, *Longirostres* Kükenth., of Section 58, *Hymenochlaenae* Dreger. It may be worthy of mention that only two of the remaining thirty-eight members of the *Hymenochlaenae* are European plants, namely, *C. strigosa* Huds. and *C. capillaris* L., both of which extend into Britain with *C. sylvatica*.

The purpose of this Note is to record the discovery of *C. latifrons* in Europe, and to describe as a new species a second near relative of *C. sylvatica*.

Carex latifrons Krecz. (*C. latifolia* Boiss. et Bal.)

The name *Carex latifolia* Boiss. et Bal. (1884), is a later homonym of *C. latifolia* Gmelin (1791) and *C. latifolia* Moench. (1794), and Kreczetowicz has accordingly renamed the plant *C. latifrons*.

It was discovered by Balansa (no. 990) in the Djimil Valley, Lazistan, in July 1866, and described in Boissier, Fl. orient. **5**, 421

*Continued from K.B. 1938, 248.

(1884). N. Albow, Prodr. fl. colchic. 251 (1895) gave a " descriptio emendata " based on " mes nombreux échantillons d'Abkhasie et de Mingrélie." This plant of the Caucasus may be briefly described as resembling *C. sylvatica*, but differing in its stouter stems, broader leaves, and more densely-flowered spikes with shorter utricles.

In July 1932 Messrs. N. Y. Sandwith of Kew and A. H. G. Alston of the British Museum discovered a sedge in " damp shady ravines in beech woods on the upper slopes of a valley, at about 1250 m., Armensko, W. of Florina, N.W. Greek Macedonia."

This plant is considered to be conspecific with *C. latifrons* and therefore new to the flora of Europe. It, too, bears the number 990 !

Several slight differences indicate that the Macedonian plant is varietally distinct from *C. latifrons*, but their precise relationship is left undecided until more material is available. The most noticeable of these differences is the position of the terminal (male) spike, which in the one is long peduncled, but in the other almost sessile between the two uppermost female spikes. It should be noted that in each plant the male spikes consist of one of normal length and a very short and small one at its base. *C. sylvatica*, on the other hand, has almost always only one male spike. The other differences, in addition to the peduncled male spike, found in the Macedonian plant, are that the terminal male spike, the female spikes, and the utricles are all slightly longer than in the other. The bracts, too, are smaller and fall short of the long inflorescence, whereas in *C. latifrons*, with its more congested terminal spikes, the bracts overtop it. The significant thing is that the more important parts of the European plant—the female spikes, the glumes, and the utricles—differ only in size, and only slightly, from the same parts of the plant from the Caucasus.

Carex algeriensis Nelmes.

Two years ago, in the Grande Kabylie mountain region of northern Algeria, Messrs. A. H. G. Alston and N. D. Simpson collected a *Carex* which is sufficiently distinct from *C. sylvatica* Huds. to constitute a new species.

Carex algeriensis *Nelmes*, sp. nov. ; affinis *C. sylvaticae* Huds., sed culmis longioribus, spicis masculis tribus aureis, spicis femineis longioribus gracilioribus distantioribus magis laxifloris, utriculis longioribus in rostrum magis sensim attenuatis differt.

Culmus ad 95 cm. longus, gracilis, laevis, foliatus. *Folia* inflorescentia breviora, 4–8 mm. lata, plana. *Inflorescentia* e spicis 7–9 composita ; spicae inferiores pedunculis e vaginis bractearum longe exsertis, superiores pedunculis inclusis. *Spicae* 3 superiores masculae, aureae, graciles, cylindricae, terminalis 5 cm. longa, ceterae breviores, sessiles ; ceterae superiores 1–2 androgynaecea excepta femineae, 5–6 cm. longae, graciles, laxiflorae, pedunculatae, pedunculis secus angulos scabris. *Bracteae* inferiores foliaceae, inflorescentia breviores, longe vaginantes. *Squamae* femineae

ellipticae, membranaceae, albescentes, nervo mediano interdum viridi leviter excurrente. *Utriculi* squamas multo superantes, 5·5–6 mm. longi, membranacei, ellipsoidei, obtuse trigoni, vix patentes, pallide virides, glabri, obsolete nerves, in basin contracti, in rostrum longum laeve vel scabridiusculum ore bidentatum albescens dentibus strictis brevissimis praeditum sensim attenuati. Stigmata 3.

ALGERIA: Yacoûren; between Bougie and Tizi Ouzou, ravine in deciduous oak forest; April 27 1937, *Alston* and *Simpson* 37,614.

Through the kindness of Dr. R. Maire I have examined the material under the name *C. sylvatica* in the University of Algiers. It consists of two gatherings, undated, but made by Dr. L. Trabut some years ago in Algeria. The specimens are rather poor; in one the utricles are immature and in the other they have mostly fallen. So far as can be ascertained these plants present characters intermediate between those of *C. sylvatica* and *C. algeriensis*.

XII—MISCELLANEOUS NOTES.

Prof. L. G. M. Baas Becking.—We learn with interest that Prof. Baas Becking, Director of the Botanical Laboratory and Garden of the State University, Leiden, has been appointed Director of the Government Botanic Gardens, Buitenzorg, Java. Prof. Baas Becking has now taken up his duties, and we wish him every success in his new work.

Mr. F. L. Squibbs.—Mr. Squibbs, who left Kew in 1924 and who has been Director of Agriculture in the Seychelles since 1934, has been appointed Agricultural Officer in the Gold Coast.

JOHN AIKMAN.—The death on 22nd December, 1938, in his 72nd year, at his home, 40, Mortlake Road, Kew, of Mr. John Aikman, M.B.E., after a painful illness borne with great fortitude, is deeply regretted by his many friends. Born on 10th October, 1867, the eldest son of Robert and Margaret Aikman, at Johnsfield, Duns, in Berwickshire, Aikman was educated locally and he must have been an unusually apt pupil of a very competent instructor if one may judge from the accuracy and conciseness with which, later in life, he drafted reports and recorded the minutes of meetings in a script as legible as printed matter and more pleasant to read than anything typewritten.

Aikman's early training, which lasted 7 years, was gained at Duns Castle, where his father was Head Gardener. On coming of age he applied for appointment to Kew and on 10th December, 1888, he began work as a student gardener. Two years later, as from 1st January, 1891, he became a Temporary Technical Assistant in the Herbarium. In his case the term "temporary" proved literally accurate; his tenure of the post endured only long enough

to enable the Keeper of the Herbarium and the Director himself to appreciate the quality of Aikman's early education, for, on 7th July, 1891, he was appointed Assistant in the Director's Office, a post he was destined to fill from that date until his retirement from Government Service, on reaching the age limit on 8th October, 1932. The official recognition of his work by the conferment of the M.B.E., announced in the *Gazette* of 1st January, 1930, was amply merited.

Aikman's work during the forty-one years of his tenure of this post under three Directors was marked by a very high sense of public duty and a constant regard for the reputation and welfare of Kew as an Imperial as well as a National Institution. To a complete mastery of business methods and a very retentive memory were added in his case maturity and sobriety of judgment which earned the confidence of those he served; his unfailing courtesy and tact gained for him the respect of all who had occasion to visit the Director's Office; while all who consult the Kew Bulletin are indebted to him for having compiled the General Index to the volumes of that periodical for the years 1887–1918, which was published in 1920.

In addition to his purely official duties, Aikman performed also those of Clerk to the Trustees of the Bentham Fund (later the Bentham-Moxon Fund) and in that capacity showed that his ability as an accounting officer equalled his ability as a clerical and an executive officer. These duties he continued to carry out after his retirement from Government Service until the progress of the malady which was to prove fatal had so impaired his vigour as to render attention to business no longer possible. D. PRAIN.

New Combinations in the Gramineae.—The following new names are published here in order that they may be included in the new edition of the "List of Herbaceous Plants cultivated at Kew."

Bothriochloa caucasica (*Trin.*) *C. E. Hubbard*, comb. nov. *Andropogon caucasicus* Trin.

Festulolium loliaceum (*Huds.*) *C. E. Hubbard*, comb. nov. *Festuca loliacea* Huds.

Helictotrichon Blavii (*Aschers. et Janka*) *C. E. Hubbard*, comb. nov. *Avena Blavii* Aschers. et Janka.

Helictotrichon bromoides (*Gouan*) *C. E. Hubbard*, comb. nov. *Avena bromoides* Gouan.

Lily Year-book.—The volume of this journal for 1938 contains several important scientific papers. A review of the lilies of the *L. carniolicum* group is provided by F. Stoker, and a lengthy article on the taxonomy and nomenclature of lilies belonging to the *Davidi-sutchuenense-Willmottiae* series is supplied by A. Grove and A. D. Cotton, in which a revised classification is proposed. The volume

also contains a very valuable summary with critical notes on the more important hybrid lilies which have been raised and introduced to gardens, which is contributed by F. C. Stern. A paper of exceptional interest is that by A. B. Stout and W. M. Porterfield, entitled "Seed patterns and incompatibilities in *Lilium candidum*." This paper not only explodes current fallacies as to seed production in *L. candidum*, but is of much wider significance and is of importance to all interested in the production of fertile and non-fertile seeds in plants in general, both in the wild condition and under cultivation. There are about a dozen other articles, which are mainly concerned with cultivation and are of considerable interest to the horticulturist.

An African Survey.—The area covered by this survey,* embracing as it does the whole of Africa south of the Sahara, is vast, and as the subjects discussed include all aspects of governmental activities, the result is a complete compendium of the existing state of affairs in Africa which is worthy of the closest study.

The chapters on agriculture and the problems allied to it are naturally of particular interest and indicate clearly how closely agricultural development is bound up with other branches of administration, such as forestry, veterinary service, education, public health, and so on.

The arguments for and against capitalist farming and peasant agriculture are clearly put and it is pointed out that only in the case of a few crops such as sisal, tea and sugar can the capitalist expect to obtain results commensurate with the money invested. It is a pity that these two systems are regarded in some quarters as irrevocably opposed to each other, as there is no real reason why this should be the case. Instances could be quoted from other parts of the tropics where the two systems have been combined to the mutual advantage of both; the planting company providing the capital for the necessary machinery and processing plants, thus ensuring the quality of the product, and the peasant, either producing the whole of the raw material on his own land or else growing a portion of it and devoting the rest of his time to raising food crops or hiring his labour to the plantation estates. This necessitates land settlement for peasants and the references to this important subject are of particular value at the present time when so much consideration is being devoted to the problems in the West Indies and other parts of the Empire.

Mention is made of the various experimental stations or laboratories that have now been established for agricultural work and the need for closer co-operation between the various research workers is strongly advocated. Although much has been done in

---

* "An African Survey: A study of problems arising in Africa south of the Sahara." By Lord Hailey, G.C.S.I., G.C.I.E. Oxford University Press, 1938. Pp. xxxviii+1837. Price 21*s*.

recent years by means of inter-departmental conferences, by the Colonial Agricultural Advisory Council, and by frequent inspections by the Agricultural Adviser to the Secretary of State, the author is still not satisfied that sufficient co-ordination has been achieved and is of opinion that much can still be done to insure continuity in research policy and to prevent overlapping. He compares the British methods with those followed in the French Territories where research is under the direction of scientific institutions in Paris and the work of local officers is largely confined to field inquiries. Although the adoption of this system is not definitely recommended it is stated that it makes for closer co-ordination of effort and for some economy in staff, although it is said to leave less scope for individual initiative.

It may perhaps be remarked that economy in staff will naturally follow when trained natives become available to fill some of the posts that are at present occupied by Europeans. Africa at present suffers from a disability in this respect compared with other parts of the Tropics where trained local staff is more readily available. The chapters on the progress of education are therefore of particular value in this connexion.

Since agriculture is, and is always likely to be, the main industry of the continent, the preservation or increase of soil fertility has naturally been given great attention. The account given of the extent of soil erosion and the measures that are being taken to arrest it are of great interest. This question is bound up with re-afforestation, over-stocking with cattle and changes in the methods of cultivation. In connexion with the latter it may be remarked that the introduction of ploughs, row cultivation and new crops such as cotton, tend to increase soil erosion, unless very careful measures are taken simultaneously to demonstrate control measures such as the use of cover crops, contour drains and the establishment of a system of mixed farming.

A perusal of these pages does, nevertheless, convey a definite impression that a great deal is now being done to put agriculture on a sounder basis and that the efforts that are being made are the forerunners of still greater progress in the future.

There is no doubt that the publication of this volume will do much to educate public opinion in this country to our great responsibilities towards the British possessions in Africa. That such a stimulus is needed is evidently the view of the author, as he has suggested the establishment of an African Bureau in London. The proposal will doubtless be given the fullest consideration but whether it will be more practical to expand the activities of some such body as the African Society rather than to attempt the formation of a completely new institution is a matter for careful examination.

G. EVANS.

Lloydia: A Quarterly Journal of Biological Science.*—We note with interest the appearance of a new periodical devoted to biological science, published by the Lloyd Library of Natural History, Cincinnati. "Lloydia" we may hope commemorates at least in part the name of Mr. C. G. Lloyd, the celebrated mycologist who so often visited Kew, and thus continues the practice adopted by other recently published periodicals such as "Brittonia," "Bartonia," "Blumea," "Herbertia," etc., of perpetuating names famous in the world of botanical and biological science. The adoption of such brief titles is obviously an advantage in citation. The articles contained in the first issue are of a varied and interesting character and it is evident that the periodical intends to cover a wide field. It is well produced both as to printing and illustrations, and the format is pleasing.

The Leyden Botanic Garden.—Two years ago the Botanical Garden at Leyden, Holland, celebrated its three hundred and fiftieth anniversary, and an attractive volume† has been published in commemoration. This is very ably written in English by H. Veendorp, "Hortulanus," and L. G. M. Baas Becking "Praefectus Horti," ancient titles which are still retained for the Curator and Director respectively.

The University of Leyden dates from 1575, when Prince William of Orange granted the burghers the privilege of the Foundation as a reward for their defence of the city against the Spaniards in 1574.

Twelve years later the ground around the University was set aside as a garden, and Professor Geraerdt de Bont was given an increase in salary "if willing to continue as well in winter times to explain and administer the anatomy, as in summer to explain the herbs to students of medicine."

Since then the names of many botanists connected with the garden have been commemorated by genera of flowering plants. These include Pieter Pauw (*Pavia* Boerh.), Professor of Medicine; D. O. Cluyt (*Clutia* Boerh.), apothecary at Delft, and the first Superintendent; Carolus Clusius (*Clusia* Linn.), the first *Praefectus Horti*; P. Hermann (*Hermannia*), P. Hotton (*Hottonia*), H. Boerhaave (*Boerhaavia*), A. van Royen (*Royena*), and Brugmans (*Brugmansia*). Cluyt was one of the first Dutchmen to write a book on beekeeping, and the Hortus contained several hives. In the recently constructed *Hortus Clusianus* six old-type straw hives have been placed in a stall, on which Cluyt's motto may be read "God feeds all Creatures."

Cluyt's son, Augerius, succeeded his father as Superintendent, and travelled extensively in search of plants, even visiting North

---

* "Lloydia: A Quarterly Journal of Biological Science." Vol. I. Nos. 1–4, 1938. Lloyd Library of Natural History, Cincinnati, Ohio. Pp. 254. Ann. Subs. $3.00. Single issues $1.00.

† "Hortus Academicus Lugduno Batavus 1587-1937." By H. Veendor and L. G. M. Baas Becking. Typographis Enschedaiana, Haarlem 193 pp. 218.

Africa. We learn too that he wrote the first book on packing and shipping of trees, plants and seeds, especially over long distances.

There is still one plant alive in the garden from Clusius' time. This is a tree of *Laburnum anagyroides* Med., which stands at the entrance to the gardens. It was planted in 1600, is now 4·90 metres in circumference at the base, 17 metres high, and the crown is 11 metres in diameter. It flowers profusely every year.

In 1594 about a thousand species were growing at Leyden, in 1675 the number had increased by only 500 species, in 1685 it contained 3000 species of living plants, whilst in 1740, immediately after Boerhaave's time, there were 7000 species. Even nowadays the number is little more (8000–8500).

Leyden acted as a centre of distribution for plants from the Cape of Good Hope, which were dominant in the new acquisitions for a century after the earliest colonisation by Jan van Riebeck in 1652. The earliest Cape plants grown at Leyden were a *Mesembryanthemum*, *Haemanthus coccineus* Linn., and *Pelargonium triste* Ait.

Leyden also had a great deal to do with Rheede's "Hortus Indicus Malabaricus," a classical work of pre-Linnean botanical information from the East. Seyen, director of the garden from 1670 to 1678, supplied commentaries and notes to the first part, which ran into twelve volumes, and was later edited by others including Commelin. Hendrik Adriaan van Rheede tot Draakestein (1635–1691) was a Utrecht nobleman who entered the navy at the age of 14. At 20 years of age he was appointed midshipman in the East India Company, and ended by being a Member of the Council of India and Governor of Malabar. We learn that on the pretext of expeditions to the interior in his function as governor, van Rheede was accompanied by hundreds of natives, who collected plants for him. He was assisted by Paulus Hermann, a surgeon, who later held the chair of botany at Leyden as successor to Seyen, and he employed four native artists to draw plates from the living specimens. Later, in 1672, at the instigation of Seyen, Hermann sailed for Africa, India and Ceylon "in order to collect curious plants and make those plants better known by accurate descriptions." Hermann's collection of dried plants and drawings of Ceylon plants was used by Linnaeus in his "Flora Zeylanica" (1747). Linnaeus found the collection at Copenhagen, and it is now in the Sloane Collection at the Natural History Museum, South Kensington, Sir Joseph Banks having purchased it for £75! There are, however, two collections in book form in the Leyden Herbarium containing 157 sheets of plants collected by Hermann in Ceylon. In 1682 Hermann visited the gardens of Oxford and Chelsea and took back with him about 200 living plants.

Peter Hotton only lived 14 years to direct the garden (1695–1709) and then was followed by the most famous of all, Herman Boerhaave. The latter was born in 1668 in the hamlet of Voorhout, near Leyden, and we learn that he was appointed to Leyden in 1709 and held the

post until 1730. Although he published very little, he was a celebrated teacher and had a large number of correspondents, including George Clifford, William Sherard, and Sir Hans Sloane.

Linnaeus visited the Leyden garden in 1735, and his "Genera Plantarum" is dedicated to Boerhaave. The latter's prophecy seems to have been fulfilled, for he wrote of it "Centuries shall praise it, the good will follow it, all will derive profit from it." The account of Linnaeus and Boerhaave provides very interesting reading, for which there is not space here for further comment. It was, as will be remembered, through Boerhaave's influence that Linnaeus obtained the post of private physician to George Clifford, the English envoy to the Netherlands and a patron of the Sciences.

Boerhaave was followed by the van Royens (Adriaan and David), Brugmans, Reinwardt (who established the Buitenzorg Garden in Java), C. L. Blume (Director of the Herbarium), W. H. de Vriese, W. F. R. Suringar, and until 1938, J. M. Janse.

The authors of the book under review are now in charge and the garden would appear to be in good hands; for they conclude: "We have great cause to feel contented, but *we should take care lest we be satisfied.*"

The sketches illustrating the work are very delicately drawn and distinctive, and are the work of several artists, Jo Spier, D. A. Bueno de Mesquita, J. Raphael and Miss Claterbos. Those by Spier, depicting Boerhaave, Brugmans and other worthies, are particularly delightful.

The volume has a preface written by the Director of Kew which is followed by a chapter giving some account of earlier Botanic Gardens in other countries such as Pisa, Padua, etc. A list of literature, an index of plant names mentioned in the volume, and an excellent general index complete this very interesting volume.

J. HUTCHINSON.

Science in Africa.*—This volume is a complement to "An African Survey" by Lord Hailey, and is one of a series of reports prepared in connexion with that Survey (see above, p. 102).

The purpose of this book, as stated by the author, is to summarize the present position of studies in the various sciences which have a bearing on African conditions. As far as possible, the more important work up to 1936 has been mentioned. The field covered is very wide, and the difficulties of collating the various branches into a comprehensive summary must have been correspondingly great. The author has wisely sought the advice of specialists on the different subjects and suitably acknowledges their assistance. Shortage of time has resulted in the omission of interesting work in the Union of South Africa and in the French territories, but the work that is being undertaken in the British Colonies, in particular, is fully discussed.

* "Science in Africa," by E. B. Worthington, PhD. Oxford University Press, London, 1938. Pp. 746. 8 plates, 5 maps. Price 10*s.* 6*d.*

So far as agriculture is concerned there is particular interest in his remarks on soil surveys. Some doubt is expressed about the feasibility of detailed soil surveys owing to the huge area to be covered and to the small size of individual peasant holdings. Their value is stated to be not so much in their immediate practical application, as in the data which can be obtained from them on the fundamental qualities of the soil. Whilst few will deny the importance of such data, many will disagree with the statement that a soil survey is not of immediate practical application. One is glad to note that attention is drawn to the termite problem which is of particular importance to Africa. In the past it has been customary to regard these insects solely as agents of destruction, but there is no doubt that many ground species are agents in the evolution of soils, and their effect on fertility is worthy of close study.

A detailed account is given of the botanical work that is being undertaken at the various research stations in Africa, including those of the French, Belgian and Portuguese territories, and the advice and assistance that is supplied by institutions in this country such as the Royal Botanic Gardens, Kew, is recorded. The value of taxonomic studies in such matters as pasture deterioration and ecology in connexion with agricultural surveys is emphasized.

Forestry problems are fully discussed and the author is probably correct in his assertion that in many parts of Africa deforestation has proceeded beyond the safety limit. Mention is made of the fact that a considerable proportion of Africa is, for reasons of soil and climate, suited only to tree growing, and consequently the conversion of useless bushlands into useful forests is urged, and the planting of exotic species of commercial value is advocated. Time alone will show whether these introduced species will well and truly adapt themselves to local conditions.

The chapter on crop plants is a valuable synopsis of work that has been done, much of which has not yet been published in an easily accessible form. One learns, for example, that the Uganda Department now recommend the planting of cassava, groundnuts and sweet-potatoes as locust-proof crops ; it is not clear, however, whether these crops are actually proof to attack or whether they are more distasteful to locusts than other crops. The improvement of crops is also discussed in some detail, including the measures that are being taken by plant-breeders for yield, quality and disease- or pest-resistance.

A perusal of the section on animal husbandry gives one some idea of the many difficulties that beset the efforts directed to improvement. Overstocking problems are discussed and an interesting account is given of the tsetse fly campaign and of the movement towards extending mixed peasant farming on new land settlements as an alternative to shifting cultivation.

One of the most important sections of the volume deals with public health but this hardly falls within the scope of this review,

although a perusal of its contents is essential to all who are concerned in the amelioration of agricultural conditions in Africa.

The book forms a valuable work of reference and is commended to the attention of all who are interested in the future of our great African Dependencies. G. EVANS.

Genetics and Horticulture.*—It is now nearly four decades since the recognition of the importance of Mendel's work on the garden pea led to the establishment of the science of genetics. During this period an enormous amount of research on inheritance in both plants and animals has been carried out, especially in institutions established entirely or mainly for or diverted to genetical investigations. Amongst such institutions, on the plant side, the John Innes Horticultural Institution at Merton stands pre-eminent, and the book here reviewed is another proof that it is fulfilling an important function both in research and in making the results of research easily accessible to a wide range of investigators and plant growers. The first edition was published in 1934, and the fact that a second has been called for is a pleasing tribute to the authors and, since it also shows the wide interest now being taken in plant genetics, to all who are engaged in genetical research.

The format of the work is excellent, it is well illustrated, and the fount is clear. The eleven chapters summarize most of the more important genetical and a good deal of the cytological work done on horticultural plants, except in the realm of arboriculture. The first three chapters adequately outline the principles of cytogenetics. Then follow excellent concise accounts of results obtained by breeding and correlated cytological investigation in plants grown for their flowers, for their vegetative parts, and for their fruits. A chapter on the chemical and genetical basis of flower colour is interpolated. Chimaeras are considered at relative length but hardly sufficient space is given to somatic variations and fluctuations. Incompatibility and sterility are dealt with in separate chapters and numerous useful suggestions as well as established facts are to be found in the final chapter dealing with the origin of new and improved forms. The book is heartily recommended to horticulturists and to botanists in general. The study of cultivated plants is not only of economic importance but it also throws light on a wide range of biological problems, the more so if the differences, not in the basic means and methods of inheritance, but in the relative importance of the factors influencing evolution be remembered.

A list of chromosome numbers of cultivated plants is given as an appendix. The authors have wrongly anticipated the apperaance of the Merton Catalogue (*New Phytologist*), which it is hoped will shortly be published. A glossary, bibliography, and index end the book. W. B. TURRILL.

* The Genetics of Garden Plants, by M. B. Crane and W. J. C. Lawrence, Macmillan & Co., Ltd., London, pp. 287, 62 figures, second edition 1938, 12*s*. 6*d*. net.

Printed under the authority of His Majesty's Stationery Office
By the South Essex Recorders, Ltd., Ilford.
(59) Wt. 17/32 800 3/39 S.E.R. Ltd. Gp. 381